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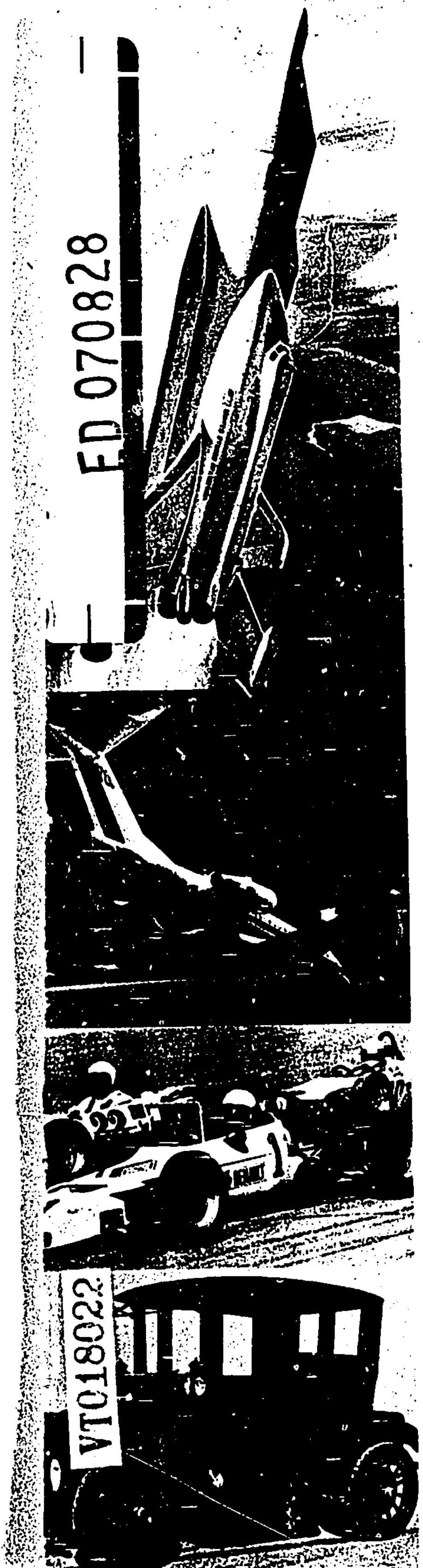
ABSTRACT

Representative addresses and proceedings of the American Industrial Arts Association's 34th annual convention at Dallas in 1972 are divided into general session speeches and selected addresses from the major group and special interest sessions. The following groups are represented: (1) American Council for Elementary School Industrial Arts, (2) American Council of Industrial Arts Supervisors, (3) American Council of Industrial Arts State Association Officers, (4) American Council of Industrial Arts Teacher Educators, (5) American Industrial Arts Student Association, and (6) Industrial Arts College Clubs. Topical groupings of the presentations are: (1) accountability, (2) aerospace, (3) career education, (4) communications, (5) curriculum, (6) ecology, (7) educational psychology, (8) electronics, (9) grading, (10) handicapped students, (11) humanism, (12) instructional technology, (13) interdisciplinary studies, (14) international relations, (15) leisure activities, (16) materials, (17) Man/Society/Technology Forum, (18) needs of industry, (19) power, (20) professional publications, (21) study of industry, (22) supervision, (23) teacher education, (24) unions, and (25) business of the association. A chronological index and a comprehensive index are appended. (AG)



Industrial Arts in a Changing Society

AMERICAN INDUSTRIAL ARTS ASSOCIATION

Industrial Arts in a Changing Society

Representative Addresses and Proceedings of the American Industrial Arts Association's 34th Annual Convention at Dallas, 1972

aiaa

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AIAA General Session Addresses

Concerns in Education

L. Harlan Ford

The concerns in education of which I shall speak are varied, yet are timely—they are areas which, in my opinion, deserve attention and resolution. Let me share some of these concerns.

IMPROVEMENT OF EDUCATIONAL CREDIBILITY

Clearly, the role of public education as seen by society in general is not the same as the role perceived by the professional educator. Lack of understanding necessitates that we develop a favorable public relations image which can lead to public support.

Teachers can develop credibility by aligning philosophy with practice and providing leadership skills within the profession. Individual needs of students must be met, rather than the student perceptions of imposed unrealistic expectations.

DEVELOPMENT OF A FLEXIBLE SCHOOL ORGANIZATIONAL FRAMEWORK

In response to a plea from patrons, students, and professionals to share in decision making and development of role responsibilities, greater flexibility within the educational organization is needed. Much attention is being devoted to the inclusion of community personnel, volunteers, early school entry, continuous adult education, community schools, middle schools, etc. However, the real problem is to implement a management strategy providing for the development of the best ideas without reprisal and without emphasizing special interest groups. Such a strategy should provide for careful planning based on local needs, analytical development, and critical evaluation of the results.

PROGRAMMATIC CHANGE

Many pressures are being applied upon the school curriculum at all levels, and attempts to include career education, consumer education, and environmental education are being met. Each of these new "thrusts" are not, and should not be, "courses" per se, but should be a part of the interdisciplinary redesign of the current curriculum to provide instruction in contemporary areas as well as the basic academic areas. A need to develop a systemic and systematic approach to the curriculum is apparent, yet attention still must be provided for the cognitive, psychomotor, and affective skills. Differing strategies and techniques to accomplish identified goals and tasks are required within an open system.

STAFF DEVELOPMENT

Professional staff members, caught in an era of rapid change, require continuous training and retraining. The emphasis today seems to be on demonstrated performance of skills, knowledge, and abilities, thus relating teaching and learning in a realistic manner. The high mobility of personnel, limited tenure for certain categories of personnel, and greater sophistication in identifying staff competencies makes for each teacher's needs to be met. Several designs for staff development have been advanced, but a continuous effort to formalize a functional staff training plan with unduplicated efforts is needed.

PHILOSOPHIC POSITION

Within the profession, many of us may identify with the idealist position, "I think—hence, I am." Others identify with the realist and his only known "real" world. Still another may view himself as an existentialist, amazed in his self-discovery of "I am!" But to me, each of us as educators must consider the human relationship of I and thou, for in so doing we see others, ourselves, and the world about us. The latter requires that we have a recognition of our limitations, that we keep a positive outlook, and that we strive for the best possible in any given situation.

Often we confuse quantity of education for quality. Both are important; we must insist on a dynamic relationship between the two if we are to confront the areas of concern in today's education.

The Future of Industrial Arts in a Changing Society

A Student's Viewpoint

Richard A. Clark

I believe that industrial arts holds an important place in my life in the technical world.
I know there is a necessity for the development of good attitudes concerning work, tools, materials, experimentation, and processes of industry.
Guided by my teachers, craftsmen from industry, and my own initiative, I will strive to do my best in making my school, community, state, and nation a better place in which to live.[1]

These are the opening lines of the creed of the American Industrial Arts Student Association. I think that if all of the ideas expressed in these three sentences were put into practice, then industrial arts would have no problem dealing with "a changing society."

Let's look more closely at the first line of the creed. "I believe that industrial arts holds an important place in my life in the technical world." Doesn't this sentence say what most educators feel about industrial arts? Technical is defined as "of or relating to a practical or scientific subject." In other words, industrial arts should be able to relate to the practical and scientific subjects of our world. This is one of the major ways that industrial arts fits into general education. The junior high student who can take his math and general science and apply them in an industrial arts course is not only going to do well in industrial arts, but also will most likely improve in his math and science classes as well. This applies equally at the high school level. A student can take the knowledge he has gained from more advanced classes and apply it to more advanced industrial arts problems. This can be done in the traditional woods and metals labs, but it has even larger applications in courses which have been introduced more recently such as power mechanics and electronics.

Industrial arts does indeed hold an important place in the technical world. In this respect, industrial arts can have a special meaning for all types of students.

For students planning on going to college, industrial arts provides a practical course to add depth to their primarily academic course load. I am a student who falls into this category. Most of my high school curriculum has consisted of academic courses in math, science, and English. However, I feel that the industrial arts courses which I have taken have been a great asset to me. Through them I have learned not only basic skills such as welding, drafting, casting, and designing, but also, more importantly, I have gained an understanding of the principles involved in our technical society. I feel that this puts me in a better position to understand some of the concepts of nature and technology to which students often have trouble relating. One example of this would be a three-dimensional co-ordinate system, used in analytical geometry. When we first started using it, because of my experiences in drafting, I was able to more readily conceive of such a system than some of the other students.

I have discussed industrial arts with several engineering professors at Texas A&M University. They have all felt that students who have taken industrial arts in high school are in most cases better prepared to go into engineering programs. Dr. Burgess, a professor in industrial engineering, explained that college engineering is becoming more and more theoretical. All engineering students used to be required to take at least one machine shop course in college, as well as drafting. These courses are no longer required, and if students do not get the benefit of this knowledge in high school, they will not get it at all. This view is probably more prevalent in technical fields, but I think the idea of adding another dimension to their high school education should be important to all college-bound students.

Another part of the student body is the group of students who may never finish high school. In this case, industrial arts provides its greatest service on the junior high level. Here, career education would be an excellent way of presenting industrial arts, so that the student would have a foundation on which to base his future career decisions. A student who cannot do well in academic courses may be able to excel in an industrial arts course. This could possibly lead him into a vocational program at the high school level. Here is where the career education would be most important—in helping the student choose a particular vocation. The student might also stay in the industrial arts program during high school. In this way he would get broader training in more than one skill, which could lead to skilled work upon the completion of high school. The important point is that whichever route the student takes, he has found a way to steer clear of the purely academic courses.

The rest of the student body will finish high school and possibly receive some additional training. However, they will never finish college. Industrial arts provides a place where they can explore some of the aspects of our technical society and receive some general skill training. This could lead to either specific job training or a technical school degree.

There are four other ways that industrial arts holds an important place in our technical world that I would like to mention. First, industrial arts provides diversification in the high school program. Although classified as general education, it really fits some place between the academic courses and the vocational programs. This means that for both the academic and the vocational student, industrial arts can diversify his high school program.

Second, industrial arts gives exposure to areas that are not covered in any other course. This exposure helps to create more interests within an individual. These interests may be either vocational, leading to job training, or avocational, leading to an interest in a new hobby.

Third, industrial arts can help to dignify the use of one's hands. It is one of the few courses where it is possible to learn manual skills. Dr. Jones, a civil engineering professor at Texas A&M, has told me that he feels a major problem with engineers today is that they are afraid to get their hands dirty. Industrial arts can instill an interest in using one's hands and do away with this ridiculousness.

The fourth thing I want to mention is that industrial arts is one of the few courses which has all types of students in it. It may be the only time that the future leaders of management and labor get to know each other. Industrial arts has the unique position of being able to bring people of different backgrounds together in one class. This mixing of people can be a real asset to the school and society as a whole.

The second sentence of the AIASA creed is, "I know there is a necessity for the development of good attitudes concerning work, tools, materials, experimentation, and processes of industry." Attitudes are certainly an important part of anyone's personality. This is an area where, in a changing society, the teacher can play a very important role. Attitudes concerning work, tools, materials, experimentation, and processes of industry should be important to all teachers.

The appearance of a lab is probably the most important way of instilling good or bad attitudes. If the lab is cluttered and machines are in ill-repair, a student can hardly be expected to take pride in his work and to take good care of the equipment. A lab of the nature I have described is most certainly a safety hazard. If students are not required to put tools away, if color coding is not used, and if safety glasses are not required, the student should not be expected to have good attitudes about safety. Of course, the attitudes of the instructors were probably formed while they were in college, so the teacher educators have a responsibility to instill good attitudes concerning safety and lab appearance in their students.

The part of the second sentence of the creed dealing with attitudes concerning processes of industry can really be taken two ways. The actual processes of industry are part of the knowledge base of the industrial arts course. However, the development of a technical literacy includes attitude, the attitude one has concerning industry and our economic society. Teachers should strive to make good consumers of their students. If a student knows technical terms, has an understanding of industrial processes, and has the right attitudes about industry, he will be a much better consumer of industrial goods. The teacher has a most important role in instilling good attitudes of work, tools, materials, experimentation, and processes of industry in his students.

The third sentence of the American Industrial Arts Student Association creed is, "Guided by my teachers, craftsmen from industry, and my own initiative, I will strive to do my best in making my school, community, state, and nation a better place in which to live." It reinforces what I have just said. The student is guided by his teachers. They play a most important role in preparing the student for adult life and in helping him make his school, community, state, and nation a better place in which to live.

Conventions of this sort can be excellent ways of teaching students about industrial arts. It gives them a more complete picture than they can get on the local level. I feel that it is the teacher's responsibility to encourage his students to participate to the fullest in this type of experience. I would like to tell a little story to show how teachers can get things completely out of perspective for their students.

Mr. Jones was considered to be a good club sponsor. He seemed to enjoy working with students, and students got along well with him. At club meetings, the time was spent discussing ways to raise more money and then in discussing what would be the most fun way to spend it. There just never seemed to be time to discuss industrial arts. When it came time to go to a convention, Mr. Jones suggested that they get away from the hustle and bustle of the convention. He felt it would be best if they stayed some distance from the convention center. They played poker most of the first night, and so the next morning it was only natural to catch up on sleep rather than to attend the convention. This club did not attend the banquet because its members would not be getting any awards. Mr. Jones didn't stop to consider that this was because he had not encouraged his students to enter the contests. When they got back home, the students reported that they had had a great time. At the end of the year, Mr. Jones was elected as the outstanding club sponsor for the school.

There is no doubt that Mr. Jones guided his students. The question is, did he lead them in the right direction? I would hope that each classroom teacher and teacher educator would evaluate himself to see what type of guidance he is giving his students.

The phrase, "craftsmen from industry," brings up a question in my mind. Do industrial arts programs make enough use of personnel and procedures of industry? I think, in our changing society, industrial arts needs to move toward a closer relationship with industry.

I have gone over the first part of the AIASA creed step by step. It gives an idealistic approach to industrial arts as the student sees it. Since it is idealistic, it provides, at least in part, a direction in which industrial arts should move in our changing society.

Departing from my interpretation of the AIASA creed and thinking in terms of industrial arts as a curriculum area, let me share several quotes with you.

> Woodworking as a subject in a course of industrial education does not justify its popularity and the importance given to it. In many of our schools, it is taught to the exclusion of all other industrial arts subjects, and in most schools it is given the place of greatest importance. In many courses, instruction in woodworking occupies the first year or even two years, and the majority of the students receive no other training.[2]

This is a quote from an industrial education publication. I have been familiar with several industrial arts programs, and I think this quote expresses quite well the way in which too many industrial arts departments are set up. How many parts of a space craft are made of wood? Sure, other courses are taught, but in this age when we can send men to the moon, I think too much emphasis is put on wood. This emphasis is changing, but it is something about which people in the field of industrial education should be concerned.

Some of you may have guessed that my quote was not from a recent article. As a matter of fact, it was from the July issue of the Industrial Education Magazine, printed in 1922. I may have put wood a little lower than it should be, but I think the comparison between the 1922 article and the situation today does bring up a good point. This talk of change has been going on for a long time; it is not new. I think that the theme of this conference, "Industrial Arts in a Changing Society," shows that there is a desire to bring about some needed changes. As a student, I feel that change is needed, and my hope is that more will be done than just thinking about it in convention themes.

I would like to take a short time now to quote an even older article. This article is a reprint of a speech made by Charles B. Gilbert in 1901. He was the Superintendent of

Public Schools in Rochester, New York, and seemed to be in strong support of the manual training program. Maybe some of his ideas will seem insignificant to you, but I personally was surprised to find that there had been such a deep understanding of industrial arts philosophy and problems at the turn of the century. Now quoting Mr. Gilbert:

> I do not regard manual training as a subject for the few, the poor, the toilers with their hands, alone. It is a legitimate, proper, and necessary branch of modern education . . . and as such it should be placed in the curriculum of our public schools of all grades. . . . The man who puts his dream, his inspiration, his ideals into a painting, a statue, a temple, serves man as effectually, and in as high and idealistic a sense, as he who puts his into the form of a poem or proverb. Nay, more; the man who puts his ideal into solid, useful form, though not aesthetic —he who makes a tool for man to labor with, a machine to lessen human toil, an engine to annihilate space and bring two worlds together—is as truly serving civilization and may be as genuine an idealist as the author of an epic or the builder of a church; hence education, if it is to fit the child to have sympathy with the present civilization, to fill him with desires for service to mankind, cannot ignore these other arts.[3]

I like Mr. Gilbert's points. He is saying that industrial arts has just as important a place as English literature. I'm sure there are many students who wish that the school viewed it that way. Mr. Gilbert continues:

> . . . manual training in public schools is necessary to a thorough and sympathetic understanding of our civilization. This cannot be obtained by mere reading about those material triumphs . . . the boy who has hammered and chiseled and sawed to produce something of beauty or some object of utility out of unyielding material is in a position to understand mechanical triumphs . . . manual training . . . has a marked tendency toward the breaking down of lines of class and the creation of true democracy. . . . The boy who has worked at the bench, his elbow touching that of another boy of totally different home environment and training, is more likely to appreciate the value of honest effort in any line . . . the questions of the difference between those who labor with their hands and those who perform other kinds of labor will not be solved by legislation. They are moral questions, and will not be settled until men sympathize with men regardless of class and recognize the good in one another. . . I believe that the general introduction of manual training into the people's schools will have a strong tendency to produce this sympathy.[4]

Here, Mr. Gilbert has said what I was trying to say earlier. The industrial arts program offers a unique opportunity to mix the classes. Even today this could be done to a greater extent. Mr. Gilbert now gives some more of the values of a manual training program.

> . . . There is no better field in which a trained mind can serve humanity than in the ranks of skilled labor. . . . If by courses of manual training taste can be directed to this department of human effort, and large numbers of our best-trained young citizens can be led into these fields of labor for life, the leavening process will be tremendous. . . . The man who conceives, designs, and makes things is performing the highest function of mind. This is what is done in a proper course of manual training. . . . The advantage of manual training work for young people is its reality.[5]

In conclusion, Mr. Gilbert states: "...My belief, then, is that manual training in some form should be a part of every public school course, from the kindergarten through the high school, at least."6 "...through the high school, at least." Is this a hint of an even greater goal for industrial arts? Should our program include more adult education to familiarize society as a whole as to the ways of our technical society? It is something to think about.

I think Mr. Gilbert made some very good points. Although he does not describe industrial arts exactly as it is today, I do think that his description of an industrial arts program is no worse than many now in use. It is hard for me to understand why we are still trying to implement ideas that were expressed in the early 1900's. Is the process of change really that slow?

It is my understanding that there is a movement under way in the profession to change the name of industrial arts to industrial technology. Is this name change really of any significance? In the early 1900's it was manual training, then manual arts, and now industrial arts. That makes three name changes. However, the problems facing the profession are much the same as in Mr. Gilbert's time. If something can be gained by a name change, fine. However, I think more could be gained if the time being spent in promoting a new name was spent in correcting the old problems.

I have given my view, as a student, of the present status of industrial arts. I have also listed some of the problems as I see them. I think these problems can be solved, and I think that the help of the students will be needed to do it. Some students come in contact with many people outside the field of industrial arts. If they have an understanding of and an enthusiasm for industrial arts, they can help to present industrial arts to the general public. And an informed general public is a necessity if industrial arts is to successfully improve its image.

Nationally-funded curriculum studies are presently under way in the field of industrial arts. American Industries from Stout State University and IACP from the Ohio State University are two of these programs. These types of programs are important because they can delve deeply into problems and come up with answers. I am most familiar with IACP. I think that this study has come up with a very unique, yet practical, approach to teaching junior high industrial arts. However, this is not to say that there are not other ways that might be better. Also, as far as I know, no major study is under way to look at industrial arts programs at the high school level. There are still plenty of opportunities for research in the area of course curricula.

Once these curriculum studies have been completed, the final course material must be implemented into the schools. They must be adopted by school systems and then adapted to fit their specific needs.

Teacher educators can play an important role in helping to get these new programs started. From my experience, many teacher educators have a very positive attitude concerning these newer programs. But did you ever take a critical look at the teacher education offered the new industrial arts teachers? A high school teacher is limited by his professional preparation. I have been asked the question, "Why do teacher educators teach teachers to teach teachers to teach teachers?" Is this all that the teacher educator programs do? I would hope not. The biggest job of the high school teacher is to relate the technical world to the students. Thus, teacher educators must prepare him to do just that.

Besides national studies, there are studies that can be carried out on the state level. Here, I would like to use Texas as an example in showing what can be done. At the present time, there is a Texas Industrial Arts Curriculum Study being conducted by the Texas Industrial Arts Association. Quoting a section from the proposal for this study:

> The purpose of this study is to update the industrial arts curriculum through a coordinated effort involving educators from various disciplines, industrialists, and especially industrial arts classroom teachers over the State . . . (and to) use consultants from industry and from other disciplines to help keep the focus of this study upon significant societal and educational problems such as knowledge explosion, technological revolution, labor shortage, youthful unemployment, dropouts, undereducation backlog, and restricted programs.[7]

This is a major study which should come up with some answers to the key problems in industrial arts in Texas.

This year also marks the establishment of the Texas Industrial Arts Advisory Commission. It is a 21-member commission which was appointed by Dr. J. W. Edgar, the Commissioner of Education for the State of Texas. It consists of people from not only industrial arts, but also industry, labor, and education. I am serving as the high school member on this commission.

This commission has four major goals which all people in industrial arts should agree are most worthwhile. They are:

1. To identify the educational role of industrial arts in our technological society.
2. To develop recommendations for supporting the implementation, evaluation, and redirection of industrial arts programs at all levels.
3. To improve communication between education, industry, labor, and government.
4. To encourage cooperative planning between industrial arts as general education and occupational education as vocational preparation.[8]

These goals will have to have their beginnings in reality at the teacher education level.

Just this past week, I was a member of a panel that presented industrial arts to the Texas Advisory Council for Technical-Vocational Education. It is hoped that out of that meeting and ones similar to it, a better working relation can be established between industrial arts and vocational education, a relationship which I am sure you will agree is very much needed.

These are just three examples of attempts being made in Texas to correct some of the problems in industrial arts. I'm sure there are similar programs in other states and I'm not saying Texas has all the answers, but I would like to applaud the industrial education profession in the state for the efforts they are making to improve industrial arts.

My experience with industrial arts has been that few people outside the field really have an understanding of what it is. Our problem may be something like that of Dr. Pepper. If people tried us they might like us. However, it takes quite a bit of publicity to get people to try you. School administrators and counselors could help a lot in getting kids interested in industrial arts. Unfortunately, my experience has been that many of these people don't really know what it's all about.

Another group that lacks understanding is the students. A friend of mine has complained that the students in industrial arts don't even know what it is. I think that I have the answer to this problem. It is a strong cluo program.

VICA, Vocational Industrial Clubs of America, and AIASA, American Industrial Arts Student Association, were both formed in the early 1960's. This year, VICA has over 60,000 members and AIASA has about 3,000. This points up some weakness in our club program. I feel that it is the fact that our clubs are strictly extracurricular.

All VICA and FFA teachers receive training in organizing and running clubs before they go out into the teaching world. They also receive instruction in working with youth. This type of training is not given in most of the present industrial arts teacher education programs. I think that this type of training could be of unending benefit if it was used properly in the industrial arts program.

Although it is not always true, in many cases, VICA students are required to join the club. This is certainly not the case in industrial arts. My association with club work has led me to believe that a strong club program can also improve classroom interest. For this reason, I think it would be good if the club was made a part of the class. If only 30 minutes were spent on club activities each week, it could help to create interest in the club program. This type of interest cannot help but be contagious and should carry over into the regular class situation.

Of course, to hold this interest, it will be necessary to develop a strong club structure at the national level. I think that good ground-work is being laid in this respect. Just this year, a new AIASA Constitution has been adopted. It outlines an excellent structure. On the student level, besides the regular officers, there are now four regional vice-presidents. It is their job to promote the American Industrial Arts Student Association in their region.

The constitution also provides for a full-time professional industrial arts person to work with the organization. It is my understanding that the position will be filled this next year. Also, a foundation has been formed to seek funding for scholarships, salaries, and other expenses incurred in the operation of the AIASA organization. I hope that through this foundation the AIASA program can be strengthened and that the stronger student club organization can then assist the industrial arts profession in building a positive image. I believe that if a full-time director of student clubs can be employed and the funds subscribed to by the foundation can be utilized for student club activity, AIASA can serve a leadership role.

Once this national structure is functioning well, there should be no problem in implementing it in schools across the country. This is my solution to answering the student's question, "What is industrial arts?"

The challenge that is now facing all of us is to work together to educate school administrators, counselors, and society as a whole as to just what industrial arts really is. As stated in the AIASA creed, "I believe that industrial arts holds an important place in my life in the technical world."

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Mr. Clark is the 1971-72 President of the American Industrial Arts Student Association and a senior at Bryan High School, Bryan, Texas.

The Future of Industrial Arts

Allan Riggs

My topic this evening is the future of industrial arts. Before I get too involved, I'd better admit that all the comments I will discuss are not solely my own. I have taken many of them from fellow students, teachers, and educators. In passing, I would like to say that I feel flattered and honored that I was asked to represent my fellow college students.

I am sure that most of you are aware that the future of industrial arts rests in our hands, more so than any other group in the United States, and it is your presence at this convention that demonstrates your professional interest in what is to come. Furthermore, your attendance here represents the "cream of the crop" of industrial arts; those who are concerned about the direction we are taking.

The future of industrial arts lies in a number of areas, particularly in those concerning the learner, technology, and society. In preparing for this presentation I looked through a number of publications. One of them was "Innovations in Industrial Education" by James Cochran, in which he discussed some 20 different programs for the instruction of industrial arts, each of which purported to be the way. These programs range from the traditional to the Industrial Arts Curriculum Project. Of these 20 programs, it is possible that a program might be developed that would provide the relevance that we talk about for industrial arts in a changing society. Typical of my generation, I can tell you what is wrong but not how to fix it except in generalizations like combining similar programs or eliminating the unused ones.

Possibly the best way to examine the future of industrial arts would be to discuss those things in industrial arts that are accepted as good educational practices.

It is generally accepted that the purpose of an educational system is to instill in individuals the nature of the society in which they live and work. Obviously, any such program must revolve around the student, for without students there is no need for schools.

The learner, and the changes in his social environment, present and future, become clear in the classroom. As a result, it is our responsibility, as educators, to acquire and demonstrate appropriate knowledge, behaviors, and skills, through learning activities and experiences, that will assist us in acquiring a basic understanding of our technological society and make us aware of the importance of being able to make successful adjustments in our ever-changing world.

When planning the learning activities with respect to technology and society, one cannot analyze each separately. To some degree, technology determines the level and nature of the society in which we live and work. This is why an understanding of technology is so important in today's society and the society of tomorrow. This is what industrial arts does; it provides an understanding of technology.

Through this understanding of technology, a student is taught not only the mechanics but the principles of a process, which allows adaptability. In addition, the student learns the social problems and effects of that process on human relationships.

Industrial arts is a multi-disciplinary field of study. It allows a student to apply his academic foundations in a practical manner. This is the main reason I like industrial arts; it gives me a chance to put all of my "book learning" to use, which in turn makes me a little more receptive to sitting in class. Not only does industrial arts allow me to apply my academic foundations, it also gives me daily practice in real problem solving— I have to think, not regurgitate facts and formulas.

Another characteristic of industrial arts is that it is performance-oriented and has been since 1876. It allows the student to demonstrate not only what he has learned but what he can do.

A third characteristic of industrial arts is that it is a practical, more useful education in that it gives a student an understanding and appreciation of technological products. With this knowledge, he becomes an educated and discerning consumer. Industrial arts teaches more consumer knowledge than any other discipline because of its practical approach. An example of this is a course in upholstering I took at Texas A&M, in which I made an upholstered chair. While it is true that after completing that course I wasn't able to open up my own shop and make a living, I was able to go into a furniture store and tell a well-made piece of furniture from a poorly-made one and not have to depend on a salesman's word, a price tag, or a brand name as a guide to quality. I knew what to look for. Another example is the selection of simple hand tools. Today's consumer market is over-run with discount centers advertising inexpensive tools. The real challenge comes in being able to select a good, durable tool from this expanded market.

A fourth characteristic of industrial arts is that it gives a student an opportunity to be economically self-sufficient while still in school, an important factor to society as well as to the student. I know of no other discipline that has more students at the college level who can claim financial independence. Industrial arts can permit a student to receive an almost immediate return on his educational investment. After completing my upholstery course at A&M, I began work with an upholsterer who was employed by the student union at the university. My fellow students have made money as carpenters, cabinetmakers, welders, photographers, electronics workers, painters, printers, chemical plant workers, and general mechanical maintenance employees. In addition, we have students who are in cooperative programs with industry. These programs are carefully selected and coordinated for maximum educational experiences. This type of education gives a student more expertise in exactly what is expected by industry.

The personnel directors of major industries have told our student organization that they hire all of the industrial arts graduates they can get because of their broad experiences and attitudes toward work, people, and responsibility. They are not afraid to roll up their sleeves, look you in the eye, and get down to work.

An example of the breadth and depth of the role of industrial arts in education as it relates to the world of work is to look at the leadership in the field of vocational education. Much of it, especially in the area of trades and industrial education, is recruited from industrial arts.

Now, I would like to make some personal observations about the people in industrial arts. To me, they seem to be more stable citizens because they are more certain about their direction. Industrial arts people seem to be happier and more satisfied with their work and the roles they play in society. They seem to have more self-confidence about themselves and the situations they face. They grasp situations easily and don't mind getting involved in hard work or professional responsibilities. They also seem to be easier to get along with because they aren't tense or worried all the time. They have their own problems and anxieties like everyone else, but they seem to handle them better.

These are the reasons why I like industrial arts and strongly believe in its programs and philosophies.

These characteristics may be derived from traditional or innovative programs. Regardless of the program, the teacher must be able to challenge the individual student. This challenge may be in the form of motivation, communication, or creativity.

During my short lifetime, more technology, more information, and more products have been generated than in all previous history. To comprehend the scope of this explosion is indeed a challenge in itself. To adapt to these changes is even more challenging, yet we have done it with ease, and to such an extent that to go back even ten years would create chaos.

To talk of environmental problems, cultural problems, or racial problems presents no major challenge to today's young people. They are willing to take the necessary steps to reach a satisfactory solution. These people don't feel that change is necessarily a slow process. Tomorrow is today in terms of our youth. The magical year of 2000 is a fantasy in our minds, for we are willing to accept these changes that we know will come.

I have discussed the future of industrial arts in generalities. Now I would like to be specific. The skills, expertise, and curricula will have very little effect on the future of industrial arts without that all-important relationship between the teacher and student. The most important skill that any teacher can have is that skill that provides him with the ability to understand the individual student. What are we doing in our schools, colleges, and universities to prepare the teacher of tomorrow for developing human resources? The vastness of our communication systems has served to separate man from himself rather than bringing him closer as anticipated. The solution to this problem will provide a breakthrough in education.

We have discussed the characteristics of industrial arts, technology, society, the learner, and the role they have in the educational process. We have also talked about the challenge of change and its influence on the future. The complexity of all of these areas is insignificant when compared with the importance of the student-teacher relationship. I challenge each of you to concern yourself with the understanding of every student who passes through your classroom. It is on this foundation that the future of industrial arts rests.

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The Blue Collar Intellectual

Dan Kuykendall

The words "Artist" and "Artisan" are found side by side in any dictionary. Look that up in your Funk and Wagnalls.

The words are close together in more ways than that. Many people don't know the difference between them. An artisan is simply a particular kind of artist. The dictionary calls him "one who is trained to manual dexterity or skill in a trade."

To practice a trade or to manipulate the tangible objects of a hobby, you must think in sequence. You must master the practical applications of theory to the actual doing.

So you must first think in sequence, or sequentially, to learn how to do it. Then in the practice of the trade, you must think logically, to solve the problem in the work at hand—whether the long cut or the diagonal cut must be made first, whether the carburetor needs adjustment or a complete overhaul.

There is a third kind of thinking that comes into play—analytical thinking. This is logic in the opposite direction, fitting the parts of the problem back into the framework of the principles that govern the subject.

Name any single area in our school systems that teach the student to use all three forms of thinking—sequentially, logically, and analytically—three intellectual tools that will equip them to learn any subject that has ever been taught by man.

That is perhaps the biggest reason why I don't have much patience with the few voices that are raised every once in a while against industrial arts or vocational education, who think it is a waste of time and money in our modern school systems. On the contrary, it is absolutely vital to many, many students, and it would be of distinct benefit to any student of anything, whether he aspires to become a photographer, a physician, or a philosopher.

Industrial arts, more than any other one subject in today's high school curriculum, teaches people how to think. And that passes my personal test for what's important in the schoolroom. Isn't that, after all, the prime goal of education?

Your federal government certainly thinks industrial arts and vocational education are important. A few of the programs financed by your tax dollars for vo-ed include guaranteed loans for vocational students; grants to the states for vo-ed classes; other grants for night school classes for adults; financing for area vocational-technical school plants and equipment; work-study programs geared toward part-time employment while the student is still learning; Manpower Development and Training Act courses designed to upgrade workers whose skills have become obsolete; and vocational rehabilitation for the handicapped, just to mention a few of the better-known programs and, of course, all of you are aware of the fact that the Congress is currently working on S. 659, which authorizes funding for industrial arts.

Your state government recognized the importance of vo-ed in our technological world and goes hand-in-hand with the federal programs by appropriating money for classrooms, equipment, and other helps. Your local school boards, almost without exception, fight vigorously to build, maintain, and expand the programs.

So why is there almost a second-class citizenship stigma attached to the practical arts and vocational education? Why is it more socially acceptable to study Sir Thomas More than Moore's Motors Manual?

I am afraid that the artisan himself must share some of the blame for the rise of the white collar over the blue collar in today's pattern of what is socially desirable. In the cattle country of Texas in my boyhood, there was nobody who was more universally respected and looked up to than the saddlemaker—a trade that still is synonymous with pride in one's work and dependability of workmanship. An ancient saddle, handed down from father to son, could become a thing of beauty again when the saddlemaker replaced a few worn parts and stitched up a few others.

Where is that kind of pride today? What plumber steps back to admire a newly installed joint in a water line? Where are the brickmasons who would throw down their trowels in disgust if a wall was an eighth of an inch out of line when they finished it?

For other reasons, too, it is fashionable nowadays to think of the white collar as more intellectual than the blue, to think that clean hands and an efficient-looking desk are necessary ingredients to success, and to think that the man who wears a necktie is smarter than the man who wears greasy coveralls.

When you leave here today, take a good look at the first 10 persons you see at work. I'll make you a mental bet that you would be confident you could do what some of the necktie-wearers are doing, do it just as well or maybe a little better. But the ones in the open-throat shirts, you'd be totally lost trying to step into their shoes. They're the ones with the gauges in their pockets, the wire cutters hanging from their belts, and the carpenters' pencils behind their ears.

Any automobile mechanic worth his salt does more intellectual work in one afternoon than the average clerk does in a month. The clerk's hands will be a lot cleaner, but there is good reason to believe that the mechanic's mind, in a logical sense, is cleaner and more efficient—and a darn sight more independent.

I sold insurance for a living before I switched my profession to politics, but I know there are some people who would go up the wall trying to sell insurance. It simply isn't their thing.

There was a young man who began his career as an insurance agent, before he discovered the joy of being an artisan. During his sales career, he finally convinced a prospect to take out a large policy, after working on him for several weeks.

He called on him with the contract ready for signature. He placed it on the desk, reached in his pocket, and produced a fountain pen for the customer. He opened it, and it promptly leaked ink all over the contract. By the time he rushed to his office for another copy and got back with it, the customer had changed his mind.

The young salesman was so disgusted that he gave up the insurance business on the spot, and he devoted the rest of his life to making fountain pens that wouldn't leak.

His name was Lewis E. Waterman.

Waterman traded a white collar for a blue one and made the Waterman pen world famous. Would any of us have ever heard of him if he had stayed in the insurance business? I doubt it. Can any of you, right this minute, name me a world-famous insurance salesman?

The clerk has no monopoly on intellectualism, any more than the artisan has a patent on creating with his hands. Edison was a scholar in his own way; Jefferson was an inventor and an architect. Benjamin Franklin is best remembered as a statesman and the author of Poor Richard's Almanac, but who can say that his contributions of the reflecting stove, the rocking chair, and bifocal spectacles may not have contributed more to the welfare of the world?

So I can't understand the attitude toward the blue-collar man, the laborer whose hands and mind must work together. Perhaps it gets down to a matter of simple prejudice.

You all know what prejudice is. That's the annoying little habit of being down on something you aren't up on. And prejudice can be a two-edged sword, if you aren't careful. There's a man in my office whom I'm fond of calling an anti-bigot bigot, because he's so violently prejudiced about prejudiced people.

You who are teaching the next generation of young people who will be wearing a blue collar might do well to think about this a bit. Just as you don't want the white-collar folks looking down their noses at them because they've got grease under their fingernails, nobody should make fun of the white collars because they don't know a router from a ripsaw.

There's nobody more important to you than the professional man when you want your income tax figured or your appendix taken out or your rich uncle's will probated. And certainly, the most important man in the world to him when he's standing in the shop is the professional who can honestly tell him if he's going to have to buy a new frammis assembly or if the old one can be fixed.

But do you know what we're headed for? We're on a 100-mile-an-hour collision course with a crisis in manpower, because the white-collar folks have made their way of life so desirable and so socially acceptable that there aren't enough blue-collars to go around. We're faced with a critical shortage of people who might know that the old frammis can be fixed, and the repair shops are going to have to hire whomever they can get, and these are the people who are going to have to install a new frammis just because they don't know how to fix the old one.

The U.S. Department of Labor estimates that there will be more than five million jobs available for skilled workers by 1973. Most of these jobs will be in the apprenticeable trades, but the number of people completing their apprenticeship training next year will be less than half a million. The Labor Department, rather gloomily, forecasts a shortage of at least half a million skilled apprentices a year for some several years to come, and they predict that the shorage will grow progressively worse instead of better.

Vocational education is making dramatic results in combating poverty, in making useful citizens out of the hard-core unemployable, and so it has come to represent the panacea that will cure poverty. Of course, it isn't that simple, but that seems to be the only image one gets when vocational education is mentioned.

Unfortunately, vocational education does not reach nearly enough people, partly because of the academic snobbery that exists in some circles, but largely because of insufficient emphasis on the pre-vocational, occupational guidance contributions of the practical arts—particularly the industrial arts. Vocational education funds are concentrated on the tenth, eleventh, and twelfth grade students in the secondary schools, but students cannot—and will not—make occupational choices at the tenth grade level unless exploratory experiences are provided for them in the junior high school. Some students are getting these experiences in industrial arts, largely through local funding. Hopefully, the enactment of S. 659 will strengthen industrial arts programs by making it possible for federal funds to be added to the local funding that has nurtured industrial arts for nearly a century.

I have just alluded to the pre-vocational aspects of industrial arts. We know that industrial arts experiences assist young people in the making of occupational choices, particularly those who plan to enter one of the skilled trades. But what about the students who plan to enter a profession? Of what value is industrial arts to them?

Its value ought to be obvious in every level of our society. Isn't the nuclear physicist better off because he learned how an internal combustion engine works while he was in high school? Isn't the surgeon more relaxed, less tense, and able to do a better job Monday through Friday because he spends Saturday and Sunday building a barbecue pit, working with his hands, and using skills that were taught him before he ever entered medical school?

Isn't it just possible that I am a better congressman as a result of my early training at a carpenter's bench and my hobby of woodworking that I still enjoy? I'd like to share another question with you. Have you ever heard of a student riot at a vocational-technical school or in the industrial arts lab?

You might take a minute to ask yourself why not. Is there something special that makes them immune to the hysteria and the desire to tear things up?

No, I don't think they have a built-in immunity. Technically-oriented students probably get just as impatient with an adult world that pays little attention to them, just as frustrated with long delays in changing things as anybody at Berkeley or Ithaca or Howard University. I think maybe the basic difference is an awareness of waste.

Before any student is allowed to use a power saw in his first shop class, his instructor tells him about waste. He probably tells him to the fraction of a cent how much a board foot of stock costs, and how much it would cost if he cuts it wrong and has to throw it away and start all over with another piece. Same way when you worked on your first metal lathe, or cut your first piece of upholstery. You've had waste preached to you for so long, it's part of your nature to avoid it.

So I think that is their immunity to the insanity that has swept over our campuses in recent years. Not because it's illegal, not because parents and teachers wouldn't approve, but simply because it's wasteful. It would waste time and energy. It would waste the school's resources, both physical and mental. It's as wasteful an activity as a student can find. And waste is contradictory to logical, analytical thinking.

Is it any wonder that I'd like to see industrial arts classes in every high school in the land, for both boys and girls? Is there a better way to teach people thrift, to teach them to think, to teach them the true values of the mind and the hands that God gave them?

If every boy and girl who graduated from high school last year had learned those lessons—if they'd just learned a little of those lessons—it would change the world so much that the next generation could call the 1960's the Dark Ages.

Mr. Kuykendall is the Congressman representing the 9th Congressional District of Tennessee.

Science Makes It Known; Technology Makes It Work

John J. McKetta

It is perfectly natural for young people to be interested in technology, for there is excitement in the whole field of technology today—excitement and ferment caused by new vistas unfolding and new challenges evolving.

The struggle and suffering of man over the ages are producing a climax of achievement in this century. Only technology has the potential for creating a world of plenty, enriching our minds, giving us more leisure time, wiping out a large measure of the diseases which have plagued man, prolonging life, bringing the people in the world closer together.

What about tomorrow? In order to answer more clearly what will happen in our next 40 years, it may be interesting to go back and see what has happened in the last 40 years.

In 1932, we had no such thing as plastic, no TV, no nylon, no synthetic fiber, no radar, no ball point pens, no synthetic rubber, in fact no synthetic natural rubber, no antibiotics, no penicillin, no contact lenses, no Salk polio vaccine. The average life expectancy of a newborn baby was 49 years. Today, the average life expectancy of a newborn is greater than 70 years. No automatic electric stove, no electric toothbrush, no jet planes, no nuclear energy, no atomic bombs, no fallout fear, no twist dancing, no synthetic fertilizer, no heart surgery, no metrecal, no electric razors, no space travel. Today I am wearing clothes made of synthetic fibers—dacron, orlon, nylon—even my shoes are made of corfam, neoprene, and polyurethane. During the last five months I traveled over 80,000 miles. But Col. Glenn went further than this in only four hours, not to mention the subsequent space flights.

Now, come with me to the fantastic 40 years in our future. By 1980 we will be preparing a manned expedition to Mars. Our astronauts will travel 35 million miles to Mars in a little over two months—less time than it took the Pilgrims to sail the Atlantic. In 1972, two unmanned trips will be made to Jupiter (1/2 billion miles). But by the year 2000 we will be beyond the nuclear age and the interplanetary age. We will be in the intersolar age. We will be using synthetic methods to help us develop superior thinking ability—e.g., electronic thinking caps. We may develop a synthetic myelin to coat our brain cells to catalyze our thinking power. There is no doubt that within the next 40 years the newborn baby will live to be over 100. There will be a cure and preventive for cancer, heart disease, allergies; we will be making use of artificial plastic and electronic hearts, lungs, kidneys, and other parts of the body. New cells, new organs, new limbs, and other parts of bodies will be grown by biochemical stimulation. Yes, the day of the bald heads and false teeth and cavities will be gone 40 years from now. The crude brain transplants performed on dogs in 1968 will be commonplace among humans in 1990.

We will have automatic driving on the highway with an electric eye for our automobiles. Magnetohydrodynamics, thermonuclear and photon energy, ionization in an electric field, thermoionic electricity, plasma jet, and stellarator energy will all be working for us. Certainly we will be able to control our weather and to defog the cities, too.

We will use polyoxyglycols instead of refrigerators. The majority of our foods will be from reprocessed protein (from soya beans and from plankton).

After 20 years of research, we are just about ready to start a new industry based on a new science—petroleum microbiology.

The biologists have developed strains of single-celled microorganisms that multiply rapidly and produce protein with the essential amino acids necessary for the human diet. As their own food source, the microbes eat a combination of petroleum hydrocarbons and nitrogen and urp the protein.

One estimate is that wide-spread commercialization is within five years, and that food from petroleum sources will be common by the year 2000—first for animals and then for humans. Your own local gas station may also become your local drive-in. You may hear the phrase, "Fill her up and a petroleumburger, please!"

Yes, electrons and protons will shape the future. By 1978, two out of three new electric power plants will be powered by a few pounds of uranium. Of course, we will still need oil—all we can get—and we will continue to depend heavily and primarily on oil. We will need other sources of energy to supplement our petroleum energy. Yes, we will have a peaceful use of the hydrogen bomb in the next 40 years. The thermonuclear reaction will be harnessed and will be another source of inexhaustible power. Deuterium (abundant in the ocean) will be the fuel. From only two pounds of deuterium will come the fantastic amount of 100 million kilowatt-hours of electricity.

A new sight will appear on the landscape—huge parabolic mirrors that circle with the sun and drink up its energy. They will be dotted with solar cells to catch the powerful rays of the sun. The cells will convert the rays to energy. A new science of the sun will emerge long before 40 years are up.

Oceanographic technology will bring us billions of dollars each year of new industry and new products which are not in existence today. By 1980, 15% of the gross national product will come from ocean industry. What about the understanding of life itself and the starting of life artificially? We now believe we know a tiny bit about the living cell. On October 7, 1968, scientists at Oxford University created a living frog from two cells taken from the intestinal wall of one frog. On January 19, 1969, scientists from two independent laboratories independently synthesized living enzymes. What will happen in your next 40 years?

Our bio-engineering program will contribute greatly to the areas of automatic pulse raters, heart exciters or pacemakers through the elbow veins, heart valves through the jugular vein, artificial muscles, synthetic corpuscle producing bone marrow, and so on.

Although we are already at the beginning of birth control pills, we are just approaching the age of artificial life. By 1995, the fetus will be removed from the mother's womb at about three weeks of age for maturing elsewhere—or will all this be done outside the body? On February 24, 1969, two scientists at Cambridge University fertilized 18 human eggs outside the human body to the embryo stage!

By 1980, automated equipment will produce automated equipment, i.e., a machine with power of reproduction.

By 1990, various desirable characteristics and potential defects will be programmed before people reproduce. What moral implications!

Availability of artificial organs (not transplants) will lead to production lines, both for the devices themselves and for their installation in human beings. It is my belief that millions of artificial organs will have such a long life that they will be passed on from one generation to the next.

Some current experiments already have shown that there are pleasure centers in the brain that can be stimulated by electrodes. With this kind of stimulation on the horizon, people in some future society may want to be wired to be happy. The operation to place the little connector in the scalp is quite simple, and the plug can be hidden cosmetically. It may even become a mark of beauty.

How do you educate these youngsters who will be practicing, and contributing to, technology in the year 2010? The only answer is that we must continuously upgrade the curricula so that we can give our states and our country the very best technological education possible.

Dr. McKetta is the E. P. Schoch Professor of the Department of Chemical Engineering, The University of Texas, Austin, Texas.

The Status and Future of Industrial Arts

Donald G. Lux

The definitions of a few terms are necessary to improve communication of the more formal remarks which follow. The terms and my definitions of them are:

> Liberal education: knowledge or study of truth, principles, and skill which liberates one from ignorance, drudgery, and inhumanity—it is of enduring value, regardless of one's life role—its value may not be assessed solely by judging the uses to which it may be put, since these may not even be known. The ability to read is a representative example of the knowledge and skill which make up liberal education. Liberal education may be equated with general education, although the latter term recently has been disparaged by some specialized education interests, a strange phenomenon, since a balanced liberal education is an essential base for any specialized education.
>
> Career education: knowledge or study of the purpose to which liberal education may be put and attendant information and skills such as current working conditions, wage trends, and special work requirements, etc.—of temporary value— may be of motivational value in the teaching of liberal education subjects, though it cannot be the sole motivating force in the educative process and may have very little sustained value in this connection, particularly with children. The knowledge of working conditions and wage rates and some degree of proof-reading ability make up a representative example of the knowledge and skill which make up career education.
>
> Vocational education: knowledge or study of specialized information or skill which may provide one with an advantage in gaining or keeping a wage-earning job—in preparation for most jobs, it should be brief and as close to the time of employment as possible, since most jobs demand a few hours or weeks of specialized training. Its value may be here today, gone tomorrow, since its value depends upon the vagaries of the economy and the technology.
>
> Technology: knowledge or study of techniques—covers the total range of man's activity—may be used appropriately with adjectives such as industrial, sexual, or political.

One other point should be made before getting on with my comments about the present and the future. Those anticipating predictions about the future, as a part of this presentation, will be disappointed. I tried it. I did not like it. That is to say, as exciting as it is to make predictions about the future, my track record suggests that this is not my game.

With Ray Karnes, my colleague at the time, several predictions were made over ten years ago in ACIATE Yearbook 10. Several of these will be repeated here in order to document the inability which was just mentioned.

> The fact of technology as the dominant element in the culture and social complexities which it brings will be afforded increasing importance in deriving educational goals. . . . Thus, the commonly accepted definition of industrial arts will require little alteration; but contrary to what has occurred in the past, there will be acceptance of a central purpose consistent with this definition. . . .
>
> The troublesome conflict between industrial arts and vocational industrial education will be resolved. Industrial arts will be perceived as bearing essentially the same relationship to occupational life for youth headed for industrial employment as do such subjects as mathematics, science, and communications.
>
> For some youth who are headed for college, quite advanced industrial arts courses will stand alongside the most advanced courses in mathematics and science as pre-professional offerings. This will become increasingly important for prospective engineering students as the current trend toward the elimination of drafting and other applied courses in engineering curricula is projected.
>
> The guidance function will be a total school responsibility. Industrial arts will share in this on the same basis as other school offerings related to the world of work.

These predictions are not repeated here in order to question their validity. They seem as sound to me today as they did in 1961. They are repeated in order to document that we have changed little, if any, in the past decade. Thus, much of the balance of this presentation deals with aspirations for the future, but there are no predictions in it.

It is possible to characterize the current status of industrial arts in a few words. It continues to be that instruction in secondary school drawing, woodworking, and metalworking which is not federally reimbursed (a definition first advanced by John Jarvis). To elaborate on this, one can add that it: (1) thrives in nearly every early secondary school program, (2) is found in most senior high school programs, (3) serves a predominantly male clientele, (4) has lost ground in the elementary grades in the past fifteen years (perhaps because of increased concerns for basic academic skills without a corresponding concern for applicative skills—and this trend again may be reversing), (5) is well staffed with regularly certified and highly dedicated teachers, and (6) continues to enjoy staunch student and community support. Only recently a nationally-based study reported that male high school graduates identified industrial arts as being their most interesting subject. On the whole, one would be justified in concluding that the panoramic educational scene is as rosy for industrial arts as it is for other common school subjects. Perhaps therein lies part of the problem.

There is a consensus of opinion that the schools as a whole are sick! It logically follows that industrial arts also is ill! Unfortunately, there is general disagreement upon the cause of the illness as well as upon the cure, either for the schools in general or for industrial arts in particular, but any real concern for industrial arts must be sensitive to the trauma in the total educational system as well as to that in industrial arts, which by nature is, or at least should be, a vital organ in that system. The balance of this treatise is dedicated to a professional diagnosis and prognosis for the alleged illness with the system (the public schools) and one of its vital organs (industrial arts education).

Before proceeding further, a serious qualification should be admitted by educationists generally and most particularly by the speaker. We in the education profession have a way to go before laying full claim to the title "professional." We do not now possess some of the means to that end, we often do not behave as professionals, and we commonly demonstrate little motivation to change.

A profession, among other things, speaks with both authority and unity. More importantly, it is self-directed and controlled. We lack the clinically-based research and firmly-postulated mission upon which to base authority and to make accountability possible. Also, we lack even the rudiments of a precise means of professional communication.

Perhaps our most serious limitation is our inflexibility, our unwillingness to change, complicated by a growing tendency toward self examination and withdrawal from interdisciplinary communication. The first half of our profession's century of existence was characterized by rapid change and, probably not coincidentally, widespread interaction with engineers, philosophers, college presidents, and psychologists, among others. Our early leaders participated in a variety of national meetings and, at meetings inside the profession, one found representation from many organizations by persons with varied backgrounds. Once again, the profession desperately needs to seek rapid change based upon thorough analysis and objective appraisal by a metropolitan community of scholars and practitioners. In this instance, "change" means to go back to superior practices and operating modes which were rejected by unfortunate accident rather than by objective assessment of alternatives. And it is by intent that this eventuality is here included as an avenue of change.

My purpose here is not to cry mea culpa. It is to recognize the present for what it is and to invite the profession to move forcefully and effectively into the future. It has been observed that human beings are the only creatures that can both laugh and weep. William Hazlitt, an English essayist, concluded that this is because only they are able to perceive the difference between what they are and what they might be. This kindles the human desire for change. My personal hope is that this change, in our case, is characterized by increased unified professionalism, placing liberal education first in national priorities, clearly discerning and communicating the vital place of industrial literacy in a balanced liberal education, and enabling every citizen to achieve industrial literacy, regardless of race, creed, sex, religion, or occupation.

PROFESSIONALISM

Increasingly, professionalism is equated with political "clout," with the intended goals being to gain increased financial support, particularly from federal sources, and to gain improved working conditions. This new view of professionalism is perhaps based on frustrations which have resulted from educationists being treated, by persons from other professions, as representatives from the less enlightened end of the continuum. These frustrations are likely to be heightened among industrial arts teachers who, in addition to being teachers and therefore to being snubbed by those from the higher-rated professions, are treated within the education profession like bastards at a family picnic! We are respected neither by the academicians nor the vocationalists. Having received such treatment in many and subtle ways for more than two decades, I can appreciate the desire to get closer to the trough where the goodies are. However, as with many responses to problems in education, the new professionalism is based upon an inadequate assumption and an effort which results in subverting rather than improving the system.

While I will return to this theme, it perhaps should be explained by example here and then repeated later. With limited reflection, most could probably list a series of educational reform activities and movements which have been based upon either a false assumption, or at least some folklore or a false interpretation of a proper assumption, and which then motivated persons inadvertently to subvert rather than improve the system. For example, shortly after Sputnik there was a rush to align industrial arts with math and science. This was based upon the assumption that the inadequacies in math and science education could be shored up by tinkering with those disciplines in industrial arts. Of course there was a corollary that math and science were "hot stuff" and the tinkering might reflect creditably on industrial arts. Some good probably resulted from the resulting flurry of activity, if nothing more than to increase the communications between groups of subject matter specialists within the schools who should have the closest of working relationships. On the other hand, effective treatment of the basic need to improve industrial arts subject matter was delayed. But working to improve industrial arts in this fashion, whether by focusing on math and science or careers, reinforces the prevalent but groundless notion that industrial arts lacks a substance of its own and therefore can only be enlivened by borrowing from something else.

The diagnosis that math and science instruction was not completely contemporary and relevant probably was accurate. However, the basic cure had to be prescribed by the experts in those disciplines. Furthermore, a similar diagnosis could have been made of the condition of industrial arts, and the prognosis certainly should not have been to improve it by teaching more and better math and science! More effective treatment would have resulted from having industrial arts personnel spend such time as they could with math and science personnel in delineating the interface between the subject matters and in determining how math and science instruction could have been improved, to the mutual benefit of all the subjects involved. Meanwhile, the principal effort within industrial arts should have been toward making its own substance more contemporary and relevant.

As a professional group, industrial arts teachers will make maximum progress by treating the basic causes of their problems rather than the isolated effects which result from them. The basic cure of the problems in industrial arts education lies in our unified pursuit of our own goals, not in charging off in all directions to tend whatever fires are burning brightly at the moment. We must be cognizant of the full range of educational needs and provide responsive programs as they relate to industrial technology, but we should not dissipate our total thrust by leaping from concerns for math and science to those for occupations, consumerism, space technology, careers, aesthetics, recreational abilities, et al., without regard to a comprehensive and concerted move to advance industrial arts as a whole. Professionally, we are in danger of winning a series of battles and of losing a war!

Before moving to another point, it should be noted that we fail to support a unified professional organization at local, state, and federal levels. This is not to suggest that we need a closed shop. It is to declare that we need a unified profession which knows its will and which exercises it in an organized way.

LIBERAL EDUCATION A FIRST PRIORITY

One has only to read Comenius, Locke, Pestalozzi, and Dewey to find an unchanging agreement that the schools exist in order to develop man's rational powers, to increase his self awareness. One of man's most basic needs, beyond survival, is for liberal education which aids individuals to understand themselves and their world, including the other people in it, and to work out a constructive accommodation between the two. This might include appropriate placement as a producer of goods or services (for approximately 80 out of more than 200 million), but it universally includes the need to improve the capacity for love, aesthetic pleasures, social and recreational participation, industrial literacy, and other means to self fulfillment. The current rush to worship a newly-named but undescribed god called "career education" exemplifies our desperate search for a simple solution to our most complex problem, how to improve and equalize liberal education opportunities.

Without empirical evidence, there are those who would improve liberal education by focusing on the purposes to which it may be put. Only the naive can believe that the disadvantaged, who are caught up in a failure syndrome, can break out of their socio-economic entrapment by simply trying harder (learning to love work) and by taking a heavy dosage of career and/or vocational education. To the contrary, the one assurance that these individuals have of breaking out of their ruts is to gain confidence that their basic liberal education is second to none, that they can read, compute, speak, understand and control science and technology, and function socially as well as anyone. Only with this assurance can these people believe that they can realistically aspire to any life style. Career education is not a substitute for liberal education; it is corollary to it.

Thus, career education concerns must be placed in their proper perspective from within a unified educational program under a unified administrative structure, without special leverage for funding improvements in career education at the expense of improvements in liberal education. It is through equalized opportunities for quality liberal education that the democratic ideal and maximum economic progress may be achieved.

INDUSTRIAL LITERACY

Within a balanced liberal education one must gain, among other things, industrial literacy. At one time, this may have been provided outside the formal school setting simply through family membership. This, of course, is only true in a primitive society where the family is an independent socio-economic entity. As interdependence increases and industrial technology becomes more complex (and these two phenomena may not be in the appropriate sequential order), society must either provide for industrial literacy through the formal school program or expect a citizenry which is frustrated or even endangered by its lack of industrial literacy and which is unable to make a satisfactory accommodation between man and what is increasingly an industrially-produced environment.

One point that is important above all to an understanding of the difference between career education and liberal education is that clear understanding that man is liberated from ignorance through knowledge. Knowledge is the substance of education. It may be appropriately categorized into disciplines in the humanities, mathematics, science, and in technology. This knowledge may justifiably be studied as its own end, but it also may be used for many purposes.

We must continually emphasize that career education is a purpose of education; it is not the substance of a liberal education. That is to say, for example, that one substance of music education is how to play an instrument. However, it is an individual decision whether this substance, this knowledge, is to be used for personal pleasure, to enable one to serve more effectively on a school committee, or to make a living. Similarly, to cite another of an unlimited set of possible examples; how to construct a sentence, how to write a letter, and how to punctuate are part of the substance of rhetoric. Only an individual makes the choice of whether to use that knowledge for generating personal correspondence or a best seller or both. And regardless of the choice made at a particular point in time, every individual still must gain the knowledge if he would be literate.

To continue, driver education is essential knowledge for our total population. Yet, for that 5% of the male labor force who are making their living driving a motor vehicle, it is also essential career education. Thus, driver education must be considered to be one of the essential elements of career education. Yet these offerings are not commonly federally reimbursed as such, which only suggests that there is confusion over what is career education, if proof of the point is needed.

Industrial arts, if it is to achieve its mission, must deal primarily with the substance of education, most particularly with industrial technology. It certainly may not ignore the purposes of this education, but the purpose is not the framework on which to fabricate a viable structure, educational or otherwise. As a profession, when we accept this fundamental point and clearly communicate it, we can expect great strides in achieving the kindergarten through adult program mission we have always maintained that we do have. Industrial technology-based studies are as appropriate liberal education for college students (for their liberal education value) as they are for elementary and secondary school students. The need for industrial literacy studies at all educational levels becomes ever more evident, but our present response is disorganized and dissipated by treating various and sundry effects of the fundamental problem; namely, our inadequately conceptualized and irrelevant program fails to develop the increasingly sophisticated levels of industrial literacy our way of life demands.

EQUALIZATION OF EDUCATIONAL OPPORTUNITY

The need for an industrial technology component to liberal education is so self-evident that it should need little clarification. Yet we continue to miss the forest because of our concern for the trees. It should be of great professional concern that in some entire states children are being offered the opportunity to gain industrial literacy by taking field trips, watching movies, listening to randomly selected employed adults, and reading about things people do, toward the end that if they perceive the ends to which industrial technology is put, they will understand the nature of the discipline which supports all the activity. This is utterly asinine! This is to suggest that if one knows the purposes for which a building or an aircraft are to be used, he will understand the technology with which to construct them. With regard to a subject such as English, it is to suggest that one will come to know the principles and practices of verbal communication by studying uses to which individuals may put them. In either case, one would be well advised to organize and teach the principles and generalizations of the knowledge which is of concern and, as necessary, to spice them with examples of their unlimited and fast-changing uses.

Two major breakthroughs must be made in order to achieve a greater equalization of educational opportunities in industrial arts. The first simply has to do with the need to stop having people help us by denying us our reason for being. Specialized educational funding must not be used to throttle industrial arts offerings within the liberal education program. Industrial literacy cannot be provided by career education, but much of career education can be based upon and within an adequate industrial literacy offering. The natural relationship between the two must be strengthened, but the relationship cannot be reinforced without mutual respect and understanding.

When we recognize industrial technology as liberal education, we must accept the need to extend the program to include females. The time is long overdue when industrial arts should "do something for the girls."

In conclusion, industrial arts is no better or no worse than the rest of the common school subjects. There is much in its present status about which to be proud. But the future will not see the amelioration of the major problems which haunt us unless that pride is tempered by a realization of our inadequacies. We can perceive the difference between what we are and what we can be, and we must! Our future, if we are to have one, must include proof that our profession can be responsive to the changing educational needs of our technological society.

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ACESIA

American Council for Elementary School Industrial Arts

English Schools

Robert Hostetter

While examining one of the Nuffield elementary mathematics books used in an English school, I came upon this statement.

I hear and I forget, I see and I remember, but I do and I understand.

Many situations observed in the classroom activity demonstrated that the dedicated teachers of the children in the British Isles believe sincerely that the child is the center of all educational effort and comes first. There is a relaxed atmosphere that seems to permeate life in the school program. Time for living, constructing, understanding, experimenting, examining, playing, and just enjoying the rich assortment of environmental "things." Many Americans are shocked by the simplicity of school facilities and amazed by the rich experiences children have in this situation. Innovative classroom procedures are not guaranteed because of new buildings and commercially-prepared kits, extensive apparatus, and expensive furniture. Musical instruments are made by the children. Workbooks are not issued. The child creates or selects the materials to record his learning experiences by making his own book. The teacher does not pass out duplicated copies of the calligraphic alphabet used in an art lesson, but forms the letters for the student with the pen the learner will use for accomplishing the same. This I experienced as a student of the craft under an English tutor. The English teacher must have demonstrated proficiency to perform in the subject area he teaches. Degrees and credit hours of graduate work are not the measure of ability to teach, according to English standards.

With this as a sketchy glimpse of British school life, I know you are waiting to hear what I am going to say about the area of work that this convention has set out to examine. In England, we would be called craft teachers. In the elementary school, the classroom teacher directs all the areas of work. In teacher training colleges, I saw evidence that the students, both men and women, were using tools and materials to produce certain units that were required for the courses pursued: models for ancient history, instruments for music, measuring instruments for mathematics, and other constructed items that would add meaning to a learning situation.

Vincent Rogers in Teaching in the British Primary Schools says, "Outside the classroom, a most significant advance has been the setting up of Teachers' Centers which have made a very valuable contribution to meeting the most intractable of problems—the in-service training of teachers. Most centers have places where teachers can make apparatus; that is, give material expression to some educational idea—although some enjoy just making apparatus that could be bought."

The English classroom extends beyond the four walls. Teacher and children join in living many experiences that take place in surrounding territory. Did you know that much valuable learning is possible by exploring the nearby village church cemetery? "In the Cotswolds, children gather wool from the hedges and fields, spin it, dye it, and weave it," according to Rogers in his publication just mentioned.

SUMMARY

1. The Head of an English school is autonomous.
2. No set curriculum must be followed.
3. The elementary schools of England use many manipulative materials, many teacher made.
4. There is none of the pressure. Children have time to think.
5. Children decide on their own activities.
6. There is much structure and planning on the part of the teacher; all kinds of activities are simultaneously available.
6. In England, teachers take courses to learn and not to get credits—there are week-end seminars.
8. There is a great deal of emphasis on beauty in craftsmanship and in aspects of the environment.
9. Teachers make great use of the local environment.
10. Teachers are respected as professionals and reflect this in their interactions with each other and with children.

11. British educators have moved beyond verbalizing "child-centered education".

12. There is a happy, relaxed atmosphere in the schools and an obvious pleasure children evidence in being there.

13. Children are encouraged to learn in accordance with their individual capabilities.

14. The British elementary teacher is more concerned with the feelings of a child than the number of facts that he learns.

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The Progress of Project LOOM

John J. Geil

Project LOOM (Learner-Oriented Occupational Materials) grew out of the concerns many industrial arts people have long felt regarding the need for industrial arts programs in the elementary school. It is not an industrial arts program as such, yet it is based upon, and retains many of the characteristics of, elementary school industrial arts.

Elementary school industrial arts has long been looking for a way into the curriculum. Booka, methods, activities, and philosophy have been available, but in the main, there has been no large-scale implementation. That has at least been the case in Florida, where sporadic activity came and went with individual teachers. Recently, a few counties, such as Broward and Lee, started working aggressively in this direction by requesting in-service sources from the Industrial Arts Department of Florida State University. FSU's IA department continued to puah for in-service courses and wrote projects (never funded) which would aid in the establishment of programs for elementary achools.

After a couple of yeara, this effort and Florida legislation came to a focal point, and then things began to happen. Following the 1963 vocational act and the 1968 amendment, the Florida legislature in 1970 passed a package of bills which redefined and broadened the role of vocational education. In brief, they brought industrial arts into the new definition of vocational education and called for occupational education programs to begin in the earliest elementary grades.

Within days after this legislation went into effect, the Division of Vocational, Technical and Adult Education invited the Industrial Arts Department at FSU to develop an elementary world of work education program for the atate. An initial planning grant brought together a group of elementary teachers, adminiatrators, counselora, industrial arts teachers, vocational educators, and parents to conaider the problems and to determine direction. Information from this workshop waa used to write a propoaal for the 1970-71 school year, and Project LOOM was born.

The first year of the project began with a research phase. At the same time, the school districts which were interested in working with the project were identified and contracts were written. The directors, working with a team of graduate researchers, established a tentative format for LOOM units and worked out samples. These items were used in workshops with selected elementary teachers who are the project participants. The workshops acquainted participants with the legislation, the purposes of the project, and their roles in the project.

Following the workshops, the participants entered into the preparation of LOOM units. By June 1971, approximately 60 units were written, tested, and submitted to the project.

A second grant carried the project through the summer of 1971. Week-long workshops were held in the participating counties for the purposes of critiquing units, trial teaching, tool skills development, and on-site occupational studies. Participants were awarded graduate credit through FUS's Office of Continuing Education and received stipends from the project.

The results of the first year were promising, and another grant was made for 1971-72 which permitted expansion of the project to 130 teachers and provided additional director time and support money.

Another series of one-day workshops briefed the participants on progress and established procedures for refining the 1970-71 units and writing additional units. All participants were furnished complete sets of units and support money so that they could field-test appropriate units in their schools. By June, all of the original units will have been rewritten and many new units prepared to follow the revised format. These will be used in workshops similar to those last summer, except that we expect much greater involvement and local support.

LOOM expresses a basic concern—Learner-Oriented Occupational Materials. The learner is placed at the center of the educational effort. This may not be revolutionary, but neither is it comfortably common. Too often the individual needs of young students receive low-priority consideration.

Each LOOM unit is a complete self-contained package from which teachers will be able to choose those that are most appropriate for use at any given time. They are woven closely into the regular curriculum. Thus, occupational learning will be a regular activity rather than something set aside, as a special program. Integration into the regular curriculum is a major key to both the acceptance and success of the program.

Units consist of both software and hardware. The written portion consists of a teacher's guide, a student section, and a resource section. The kits, which we call "realia activity kits," contain media and many items used by or made by workers. Things too large or costly are represented graphically or simulated.

The heart of each unit is hands-on psychomotor activity. Situations are created which enable learners to do the same, or similar, things that workers do. They make, repair, construct, type, dissect, role-play, and do whatever else workers do. For a brief period of time, the learners are the workers. Each unit is constructed around the question, "Should I Be --------?" The learner internalizes the job and then is led to frame generalizations about what he liked and didn't like. No pressure is put on for decision making, although we know that children make decisions all the time. The decisions may last for a moment, a week, a year, or a lifetime. We really are not concerned with youngsters making decisions, and we avoid over-stressing decision making. That will come as the child grows older. Then we hope he will be able to make better decisions than he would had he not experienced early world of work education.

Evaluation of the program is, for the time being, quite simple. We hold that if teachers and students like the program, we are going the right way. Each individual unit carries an assessment of learning utilizing performance objectives, but we are a long way from entering into longitudinal studies.

Our findings so far are that students, teachers, administrators, parents, and the public approve of and endorse the LOOM approach. The teachers, most of whom never had an industrial arts course, become enthusiastic. They're demanding more in-service courses than we have so far been able to provide.

While we have no actual data, early observations and reports lead us to believe that we can expect gains in reading, vocabulary development, computation, and motivation. This is true whether the students are disadvantaged or have all the advantages. Happily, our participating schools range from inner city to wealthy to rural, so we have a good cross-section for observation. It would be unfortunate for a program of this nature to be thought of as being only for low achievers or for special socio-economic groups.

Some teachers are initially apprehensive about the term "vocational education" being applied to elementary schools, but they relax when they understand the new definition and purposes. They are also worried about using tools, but this is mostly because they never had an opportunity to learn about them. As someone said, "knowledge banishes fear." Most of our participants, once they get started, want to know why they never heard of (or couldn't take) industrial arts when they were in college. It would seem that teacher educators who over-emphasize the "academics" are short-changing our future teachers.

All indications at this point are the project will continue for at least another year. This will yield a large number of tested LOOM units and a cadre of trained teachers. Both the units and the teachers will be utilized to prepare additional teachers through workshops or in-service courses, depending upon local situations. An over-all teacher's guide, tool and equipment recommendations, and outlines for pre- and in-service training are being developed. Ways to reproduce the materials for general use are being explored.

Perhaps the major benefit to accrue from the work of the project is teacher involvement. The materials being developed are needed and are the primary work of the project. But materials, without teacher attitudinal and competency preparation, are of little value. We are finding that elementary teachers welcome opportunities for learning concrete, simple activities that they can employ with their children. The teachers become enthusiastic and are genuinely fun to work with. It doesn't really matter to them (or their students) whether we call it Project LOOM, occupational education, industrial arts, or something else, as long as it involves realistic activity.

In conclusion, elementary industrial arts now is within striking distance of becoming a general reality in Florida. We have had to accept new alliances, assume new roles, and broaden to the point where the name "industrial arts" may no longer apply. But the ideas and activities of industrial arts are finally reaching children, and that, in the final analysis, is what matters.

Mr. Geil is Co-Director of Project LOOM and a member of the Industrial Arts Faculty of Florida State University, Tallahassee, Florida.

A Technological Exploratorium, K-6

Norma Heasley

In August 1970, a proposal entitled "A Technological Exploratorium, K-6" was accepted by Title III of the Ohio Department of Education. To date, funds from the Elementary and Secondary Education Act totaling $208,180.00 have been granted to the Summit County Board of Education.

The purpose of this presentation is to relate the philosophical basis of the project and the design for implementation.

Our basic premise is that the rapidity of change characteristic of a technological society requires that man make decisions, solve problems, and be ever searching for creative designs to be used for self and group satisfaction and well being. Isolated facts and limited experiences cannot provide the needed structure or information for operating in a demanding changing world. Rather, a structure with a conceptual basis for analytical and critical thinking, experimenting, constructing, and evaluating will provide a foundation for successful experiences. Full involvement in various concrete activities designed to develop understanding of tools, machines, materials, processes, and organizations of the world in which we live will sharpen all of the senses and provide the necessary skills to become a successful and fruitful citizen. The key to success in education and in technology is human involvement. This involvement must include plans, actions, and evaluations. The major area of planning is most important. Researching, theorizing, experimenting, creating, inferring, and making decisions

permits utilization of all available resources, involves more than the mind, and provides the opportunity to weigh alternatives before an unchangeable point has been reached.

This planning provides a purpose for actions. Clearly defined goals aim toward a positive direction. Decision making, problem solving, communicating, cooperating, demonstrating, constructing, using a variety of tools, machines, and materials are all actions necessary to reach goals. In this involvement, components interact, even if the interaction is between an individual and material.

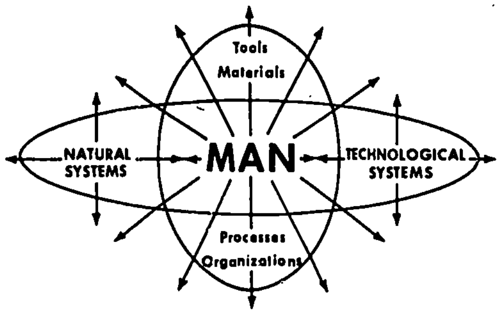
The major area of evaluation helps determine if the goals have been reached. Analysis provides perspective of what has been done and allows for projections for future actions.

However, the total experience rather than the project is stressed in this study of technology. Content and method are considered of equal benefit in trying to get students to think from more than one vantage point. It is believed that by involving both content and method, the experience will be broader and more meaningful. These experiences are not added on to the curriculum. Rather, an analysis of the basic knowledge and academic, social, and physical skills necessary at each level is made and planning for their comprehensive development is done through a technological study.

Emphasizing man as the foundation for all involvement in the study of construction, manufacturing, communication, transportation, power, services, and recreation, the stress is on what man does to develop, advance, and/or control technology and how this affects his life. Through research and development, man begins to understand the effect technology has on economics, politics, change, values, and organizations that develop his society. As these components are blended, a study of "Man, Society, and Technology" results. Children use tools and materials and become involved in various processes for this study. The continuous multiple sensory input enables the student to understand the direct correlation between the significance of man's technology and the student's own self-identity, self-esteem, and his relationship to other human beings and/or his total environment.

By taking an abstract idea like manufacturing and putting it into conceptual statement form, teachers have a point of reference from which to plan for teaching for understanding. An example would be:

CONCEPT: As man gains understanding of natural and man-made systems, he increases his ability to comprehend and utilize materials, machines, tools, processes and organizations for creating technological systems.



This gives teachers and students a different and, hopefully, a better view.

Ten experimental teachers in three schools in Hudson, Ohio, are involved in writing units of study that will include concepts, objectives, procedures, diagrams, tools and materials, pre- and post-evaluations, and additional references. Because it is hoped that educators across the country will be able to implement these units, many suggestions, questions, and ideas are also included.

IT IS TIME FOR A CHANGE IN EDUCATION!

THIS IS HOW WE PLAN TO MAKE A CHANGE AT THE ELEMENTARY LEVEL.

Ten teachers and four paraprofessionals attended in-service meetings two weeks in August 1970 to gain understanding of the purpose of the proposal and how they would become involved in planning the procedures.

Since only one of the ten had any industrial arts experience, periodic, two-hour meetings throughout this school year and last were held to gain understanding of tools, materials, and processes. Three weeks in August 1971 were also spent in this work and in writing units using this knowledge. Under the direction of the industrial arts specialists, teachers became involved in woods, metals (bench metal, foundry, and art metal), plastics (thermoforming, foaming, casting), designing and drawing, graphics (lithographic, silk, relief printing), and power, including rocketry and electricity. The meetings were planned with diversity. Some were teacher-centered to permit an interaction and sharing of ideas. Some involved learning to plan, carry out the plans, and evaluate the work, and some were demonstrations. When the industrial arts specialist makes a presentation to a class, the teacher takes notes, learns with the class, and thus gains knowledge and experience in this way. Many types of involvement influence and induce ideas for use in the classroom, and this may lead to some earth-moving experience.

Under the direction of these teachers, one experimental class, kindergarten through sixth, and three special classes became part of the research.

By the end of February 1972, all ten classrooms had a basic tool cart, work bench, saw horses, and safety unit. All the equipment and materials used for electricity, ceramics, leather, graphics, plastics, metals, woods, textiles, and rocketry are stored in a main laboratory where teachers plan with the industrial arts specialists and director, make prototypes, and do research. These supplies are then made available for individual classroom work.

Children and teachers experience total involvement. Teachers analyze the necessary components of technology, critical and creative thinking and acting, problem solving, and decision making and relate these to other skills children need.

Functional communication skills are becoming imperative in the 20th century. An objective for many experiences is to stimulate various aspects of communication.

Social studies is "experienced." Interactions are happening between all those involved in cooperative and democratic processes. Children must learn to accept responsibility for independent learning activities while others work with tools and materials. Accepting responsibility willingly and doing the best job possible is important in any field of endeavor at any age. Freedom in the classroom unquestionably means new kinds of responsibility.

An important social skill, cooperation, seems to just come naturally. It often helps to have a partner. Respect for others' efforts and work results. Science and social studies skills are gained as students become physically and mentally involved in a study of people, how they use tools, machines, and materials to develop, advance, and/or control technology, and how this affects all of life.

Children are motivated to learn language arts skills in many unexpected ways. When the tools arrived, the "Stanley Tool Catalog" became a necessary reference for classification. The table of contents and its purpose were discovered. The locating of information, written in an abstract form, became meaningful when relating words to a tool of concrete form and materials. A tool and school take on new significance when using magnetic letters to learn the alphabet while remembering other experiences.

New vocabularies develop as children learn the names of tools, their shapes, and use. An ever-increasing awareness of words and their nomenclature evolves as students study the structure, function, and value of materials. This helps the student better understand his world and how man operates in this world.

Communications has new dimensions because interactions occur human to human, human to materials, and with the human himself. Cooperative attitudes seem to result.

Supplementary skills result or are programmed to extend experiences. Listening and following directions in order to gain skills for independent planning and acting is emphasized as a kindergarten child reads the orthographic projection the teacher has made of his project.

The application of math skills are a part of every experience. Children are involved with various units of measure. Thought problems result from the work being done and must be solved, for the evaluation will be in concrete form. Math skills and understandings may be applied differently when bending a piece of plastic at a certain point, computing stocks in an economics unit, and figuring ratios.

Following patterns is a part of many technological developments and a very significant skill for understanding various math procedures. Geometric symbols representing flowers in a garden help in planning. Could all of this indirectly be related to reading, too?

Mass production activities allow students to become involved in a system vital to many facets of life. Sequential development can be learned. Each student knows and accepts a responsibility both for himself as an individual and as a part of a unit—the working group. He realizes inspection and evaluation are important to product and process control in business, industry, service, and education. Analysis of these experiences lead to understanding of environmental, physical, and psychological changes that occur.

All creative experiences subject the individual to thinking, planning, and designing, but most importantly, it permits the coming together of the limits and characteristics of a material and the mind. New dimensions are recognized.

Research is an integral part of these activities at all levels. Children use their knowledge and skills to plan for actions. This work enables the student to hypothesize the outcome, permits teacher/student interaction, including teacher guidance when necessary, and helps the student to determine the procedure he will follow to accomplish what has been planned.

Evaluation is a natural response to any experience, but the form and significance are not always defined. The value of experiences with materials, structures, and processes that result in concrete forms is revealed in both tangible and intangible qualities. In education however, the "real significance" for evaluating the concrete product lies with intangibles such as development of the ability to solve problems, make decisions, and adjust to changes. Positive attitudes, enthusiasm, and perseverance are still other desirable intangible qualities that may develop.

As the individual judges himself and makes decisions about the effect of his own body-and-mind team in all of his work, the evaluation becomes intrinsic.

Several steps have been taken to prepare for total evaluation of the results of this research project. On September 2, before school began, all parents of children in the experimental classes were invited to a slide presentation explaining the project purpose, goals, and planned procedures.

Experimental and matched control groups for each level were selected. These are heterogeneous groups with abilities and achievements ranging from very high to very low. During the month of September, extensive pre-testing took place under the direction of an evaluation expert and a team of psychologists and aides.

All children in grades 3-6 were given the California Test of Basic Skills. Children in the second grade were given the California Achievement Test. All children in grades 2-6 were given the Short Form Test of Academic Aptitude.

All children were also given the California Test of Personality, Likert Scale of Self Perception, A Student Opinion Poll, part of the Torrance Creativity Test, and a Word Association test designed for the project. Much of the testing was done individually at the primary level.

In addition to these tests, the kindergarten was screened for motor skill development and visual, auditory, and language memory. A verbal intelligence quotient was determined by The Peabody Picture Vocabulary and maturity by the Evanston Early Identification Scale (Draw a Man).

Because the neurologically handicapped and educable mentally retarded children were previously given several tests by psychologists and neurologists, there was no formal testing done by our staff.

We are now trying to develop a test that, on paper, will determine the utilization of knowledge.

We have to this point had many positive results. Parents have reacted favorably. Other teachers have shown interest and, in fact, are independently trying many activities. The only drawback to this is that it will undoubtedly affect the test results of the control children. One university that previously has had no training in this direction for future teachers is now working to develop a curriculum for such a study. They plan to offer this as an elective course. Several of the staff have been invited to speak for various groups; churches, clubs, and university classes. Many educators have visited the project and are writing about the project. At this time, Brodhead-Garrett Company is printing the first set of five of fifteen teaching aids that have been produced. Several others are in the research and development stages.

We are in the process of refining conceptual statements. These will be sent to leaders in various disciplines across the nation for their reactions. It is hoped that upon refinement and acceptance, these statements will provide the framework for studies in social sciences, career and vocational education, and any technological units of study.

In closing, I must emphasize that we are not project-oriented, but we are product-directed, and those products are adaptable children who are educated for now and for the future. If children are comfortable with materials and processes, we can assume that they will be more comfortable with new ideas, new concepts, new places and spaces.

Our belief is that man's greatest challenge is his own technology. His greatest tool for meeting this challenge is his own education!

Mrs. Heasley is Project Director, Title III, E.S.E.A., working for Summit County Schools, Akron, Ohio.

Fourth Grade Children Demonstrate Graphic Communications

Harold G. Gilbert and Judy Thome presented a graphic communications unit to fourth grade children during the convention. The children demonstrated their work for the benefit of convention participants. The activities included screen printing, block printing, papermaking, and bookbinding. The following is a resource unit for the work covered in the classroom.

INDUSTRIAL ARTS IN THE ELEMENTARY SCHOOL: EDUCATION FOR A CHANGING SOCIETY[1]

All who are concerned with the changes that are taking place in our society—the news media, economists, businessmen, and industrialists—insist that the phenomenal change that has taken place during the past decade is nothing compared with that to come. The age in which we live is one of such rapid change that even those who control and cause the change are frightened by its implications. The average citizen cannot completely comprehend the transformation; yet it is he who is creating the ensuing problem and his children who must cope with it.

Educators must awaken to the fact that they must keep pace with the changing technology. Many new and innovative devices, composing what is termed teaching technology, have been developed to help the teacher do a more effective job of teaching. But little has been done to change what is taught. Children need the exhilaration of manipulating materials, the joy of accomplishment and personal discovery as a part of growth and development and mental health. Children must learn about the world in which they live if they are to be expected to be productive and useful citizens in the world of tomorrow.

Industrial arts education is that part of the school curriculum that is dedicated to teaching boys and girls about the technological aspects of their environment. It, like all subjects, must start with the basic concepts and principles and build toward a full and complete comprehension. It, like all subjects, must originate at the beginning of the child's education. Since there are aspects of technology that are appropriate for the kindergarten child, it is here that we must begin to build the child's understanding of his world.

The discussions that follow deal with the nature of industrial arts in the elementary school, different approaches and requirements for its implementation, and some ways of meeting and solving some of its problems.

A DEFINITION OF ELEMENTARY SCHOOL INDUSTRIAL ARTS[1]

Industrial arts at the elementary school level is an essential part of the education of every child. It deals with ways in which man thinks about and applies scientific theory and principles to change his physical environment to meet his aesthetic and utilitarian needs. It provides opportunities for developing concepts through concrete experiences which include manipulation of materials, tools and processes, and other methods of discovery. It includes knowledge about technology and its processes, personal development of psychomotor skills, and attitudes and understandings of how technology influences society.

GRAPHIC COMMUNICATIONS IN THE ELEMENTARY SCHOOL[2]

The expansion of American industry has been fostered by the rapid development of effective graphic and electrical-mechanical systems for communications. The printed word has helped disseminate knowledge of new developments and has educated producers

photo by William J. Wilkenson

as well as consumers. The speed of electrical-mechanical communications makes it possible to maintain production and distribution at a rapidly expanding rate. If children are to assume positions of responsibility in this society, they need a basic knowledge of communications.

Graphic communications made a significant improvement when Gutenberg used movable metal type to print his Bible. The industry has developed stencil and offset printing to keep pace with other modern developments. The use of synthetic materials has improved inks, paper, and binding techniques. Electrical-mechanical communications started with the development of the telegraph and moved into telephone and radio. Now another dimension has been added, with television joining the video and the audio for increased effectiveness. These are developments that children can study through activities using tools and materials.

People use the printed word for pleasure and profit. School materials are printed so economically that they are used extensively at all levels from the picture books in kindergarten to the technical references in the graduate library. The latter are used as basic references in industry, where handbooks are needed by all engineers and technicians to operate equipment that is continually modified to take advantage of the latest developments. Consumption is closely geared to marketing reports which keep close tabs on the goods purchased. At home, people read newspapers and magazines that inform them of current developments as well as entertain them.

PRINTING TODAY—GIANT IN AN AGE OF SCIENCE[3]

While Gutenberg did well to produce a single one-color impression in three minutes, today's great rotary presses easily print several colors on both sides of a continuous roll of paper roaring through at the rate of up to 2000 feet per minute.

The printing and publishing industry is a very big business. Among all United States manufacturing businesses in 1968, it ranked second in the number of establishments—40,000 with 81% having less than 20 employees—fourth in average hourly gross earnings per production worker and seventh in value added by manufacture.

Of the more than $24 billion of shipments in the printing and publishing industry in 1969, commercial printing accounted for $7.7 billion, of which lithography represented

52% and letterpress 39%; newspaper and magazine production was about $10 billion, of which letterpress is the major producer, but web offset is commanding more and more of the weekly and small daily newspapers and special-interest magazines; and book printing was over $2.5 billion, of which lithography represents 75%. These figures do not include packaging, the total shipments of which in the United States in 1969 totaled $19.5 billion.

Altogether, 53 million tons of paper and paperboard were produced with a value of $9.3 billion. The per capita consumption of paper in the United States in 1969 rose to 560 pounds, as compared with 72 pounds for the rest of the world. Modern printing has become a highly scientific art. Specialized presses, inks, papers, and techniques meet every need and produce under every condition. Today's printer owes much to the Age of Science and to its experts in electronics, chemistry, optics, and mechanics.

The future is bright. As an industry, printing and publishing has a growth rate comparable to the gross national product, of above 4% per year. Offset lithography, book printing, color printing, and packaging are growing at about twice this rate, while web offset and screen printing have been mushrooming at about three times the gross national product, and gravure even higher at 15% for the period 1965-1969.

New plastics, electronic sensors, computer techniques, and other products of modern research are gradually converting printing from an art to a science. Recent printing developments include such advanced equipment as computers for typesetting in full page makeup at speeds up to 6000 characters per second; electronic scanners which determine the exact degree and nature of color correction required in color reproduction and produce corrected negatives or positives of the color separations; special processing machines which automatically process photographic films and press plates; new photopolymers for making offset plates that require no processing; electronic engraving machines which amplify light to create impulses that energize a cutting stylus for producing gravure cylinders; electronically controlled presses which perform many of the slow pressman functions automatically; and completely automated bindery machines that are capable of producing up to 150,000 books a day.

CORRELATION WITH OTHER SUBJECTS

The graphic communications unit may stand on its own objectives. However, the classroom teacher may choose to combine subjects to make a broader learning experience for the children. The experimentation with tools and materials during an industrial arts activity arouses much interest in the children. This enthusiasm might be used to vitalize the application of other disciplines and provide an opportunity for a practical application. Some possibilities are:

Social Studies

The children may use block printing to make "movable type" letters and compose printed pages as Gutenberg did with his Bible. The screen printing technique adapts easily to map making. The latter might be a group undertaking where each student produces a copy of a county or state for each classmate. The children might make paper by hand to compare it with the quality of machine-made paper.

Mathematics

The children can measure to fit a certain number of letters in a line and also to cut paper to appropriate size for printing. Accurate preparations are used to mix some inks for printing. In papermaking, sizeable quantities of liquid are measured, and accurate measures of sizing and coloring agents are added.

Science

Children might study the compounding of inks and how they dry by absorption and oxidation. Silhouettes of leaves, animals, insects, trees, or flowers may be duplicated for identification. The chemical changes in papermaking may be observed firsthand.

Language Arts

Children often compose a newspaper or booklet. Their interest increases if they print their own composition. Programs, papers, or invitations may be decorated to improve their appearance or printed on class-made paper. The children might read and follow the directions for papermaking in the Hammermill kit to see if they can accurately

ESTIMATED EMPLOYMENT TRENDS IN NONAGRICULTURAL ESTABLISHMENTS
Prepared by Texas Employment Commission in Cooperation with Bureau of Labor Statistics
DALLAS STANDARD METROPOLITAN AREA
DECEMBER 1971

Major Industries	Number of Establishments	Employment as of March 1972 Total
TOTAL, All Industries	37509	720600
Total - Manufacturing	2424	142500
Durable Goods - Total	1182	90000
Lumber & Wood Prods.	63	2000
Furniture & Fixtures	133	4400
Stone, Clay, & Glass	96	4700
Primary Metal Prods.	45	2000
Fabricated Metal Prods.	272	10600
Machinery (exc. Elec.)	243	13500
Electrical Mach. & Equip.	69	31500
Transportation Equip.	60	15400
Other Durable Goods	201	5900
Nondurable Goods - Total	1242	52500
Food & Kindred Prods.	310	14200
Apparel & Finished Prods.	224	13100
PAPER & ALLIED PRODS.	54	5600
PRINTING & PUBLISHING	419	11700
Chemicals & Allied Prods.	142	4600
Rubber & Misc. Plastics	41	1900
Other Nondurable Goods	52	1400
Total - Nonmanufacturing	35085	578100
Agri. Ser., For., Fish.	107	1200
Mining (inc. Pet. & Gas Prods.)	474	8300
Contract Construction	2335	42800
Transp. & Allied Servs.	616	35900
COMMUNICATIONS	59	10600
Utilities	33	7000
Wholesale Trade	4595	68400
Retail Trade - Total	12011	128400
Retail Bldg. Materials	488	4600
Retail General Merchandise	620	30200
Retail Food	2170	18700
Retail Auto & Serv. Stations	2430	16400
Retail Apparel & Accessories	979	9800
Retail Home Furnishings	1320	5000
Eating & Drinking Estabs.	2080	27400
Misc. Retail Stores	1924	16300
Finance-Insurance-Real Estate	3377	62000
Business & Personal Services	6901	62100
Medical & Professional Servs.	4316	58100
Government	261	78000
Private Household	INA	15300

follow directions. The quality of the paper produced will be proof of their ability or lack of it.

Art

The children might consider basic elements of design as it applies to the composition they print, or they may use the graphic media as a free expression of their feelings toward color and composition.

EVALUATION

As with other classroom work in the elementary grades, evaluation is primarily subjective and informal. The classroom teacher and the consultant frequently question the

photo by William J. Wilkenson

children, not only to stimulate their thinking but also to evaluate their understanding of the activities in the unit. The teachers may adjust the work schedule or review some phases of the work as a result of the evaluation. Because of the concrete nature of the results in three dimensional form, it is natural for the children to observe the results and freely discuss them with each other. They are usually very frank and accurate in their comments to each other, and with some guidance from the teacher, this may be kept in a constructive vein.

BEGINNING THE UNIT

The industrial arts consultant needed to get acquainted with the children by mail in this case instead of the usual practice of visiting the classroom to talk with the children and consult with the teacher. The only contact the industrial arts consultant had with the industrial community was by correspondence with the Chamber of Commerce. The latter provided statistical reports on the size and location of printing establishments. They sent a section from the yellow pages of the phone book, a list of the names and addresses of manufacturing firms in the Dallas area, and a list of employment from the Texas Employment Commission.

It would have been ideal for the industrial arts consultant and perhaps the classroom teacher with the children to visit one or two of the firms near the school. Direct observation of a typical factory with people at work is invaluable.

Bulletin board displays in the room portray different types of graphic communications. The first meeting with the children involves an informal discussion of these examples and an attempt to draw out information about any direct association the children might have with parents, relatives, or neighbors who work in the printing industry. After this discussion, the children divide into work groups and prepare to experiment with the activities described in the following resource material.

Relief Printing from Blocks

I. Objectives
   1. Students experiment with block printing to understand how relief printing works in industry.

2. Students use block printing to make prints related to their language arts.
3. Students discuss how relief printing is used in Dallas and career opportunities in this industry.

II. Tools, Materials, Supplies

jigsaw, small, portable (Dremel)
plywood, 1/4 in. fir, G1S, small trim pieces 2x2 in. or larger
flint paper, fine, several sheets
rubber cement
Speedball printmaker's plate, 9 x 12 sheet, $1 each
ink, Speedball, water soluble, 4-ounce tube, $1 per tube, assorted colors
Speedball cutter assortment #1, $1.70 for 5 blades
handle for above, 70¢ each
brayer, deluxe gelatin, 2 x 6 roller, $6 each
paper for printing (something suitable for writing)
scissors, sharp

III. Steps

1. Demonstrate process and children experiment
2. Design object to be printed
3. Reverse design and trace on printmaker's plate
4. Cut with scissors (detail with Speedball cutter if necessary)
5. Print copy
6. Trim copy for use
7. Consider application to jobs in printing industry

IV. Summary & Evaluation

The children might display their completed work on a classroom bulletin board. The children might select the better work for display in the main hall of the school. The teacher might lead a class discussion of the process to see if children understand the relation to industrial printing.

V. Things children can make as part of their experimentation

Heads or titles for room or school papers
Titles for programs for class plays or recitals
Posters for safety lessons
Posters for school functions
Titles on greeting cards
Tickets
Covers for scrapbook or class reports
Initials on stationery, napkins, or place cards

Stencil Printing with a Screen Frame

I. Objectives

1. Children experiment with screen printing to understand how it works.
2. Children design and screen-print something related to their class or school.
3. Children discuss career opportunities in screen-printing industries.
4. Some children might make a simple screen form so they might do more screen printing at home.

II. Tools, Materials, Supplies

sharp scissors
waxed paper, heavy duty
masking tape, 1/2 in. wide
stencil knife, Speedball, 40¢ per dozen
handle for stencil knife, 70¢ each (or 3/8 in. dowel stick)
hinged screen frame to print 9 x 12 in. paper, $5 each
organdy to replace screen above, $1 per yard
4 in. squeegee, bantom, blade 2 x 1/4 in. 75¢
ink, silk screen, water-soluble (specify assorted colors), $2.50/quart
(may substitute finger paint for screen paint)

III. Steps

1. Demonstrate printing and have children experiment
2. Create or copy design
3. Cut stencil
4. Set stencil in screen frame

5. Adjust guides
6. Ink screen and reset guides if necessary
7. Make prints
8. Clean screen frame
9. Prepare prints for use
10. Repeat process for multi-colored prints

IV. Summary & Evaluation

The teacher might review the prints made to ascertain if they fulfill the needs for communication. Samples of the work might be displayed for other classes or parents to observe. The teacher might question the children to ascertain if they see the relationship to screen printing in industry. The children might give written or oral reports on the latter topic.

V. Things children can make as part of their experimentation

duplicate a creative design	titles for a bulletin board display
illustrate a scrapbook	flash card for arithmetic
cover for a booklet	flash card for work game
greeting card	silhouettes of trees or animals
letter head	paper napkin
notepaper	place mat
decorative invitation	place card
book mark	pennant
poster	shopping bag
book plate	wrapping paper
nature study materials	emblem
map for social studies unit	announcement
cover for a class program	safety poster
lamp shade decoration	humorous greeting card

Offset Printing with an Office Duplicator

I. Objectives
1. Children observe use of equipment in school office.
2. Children design and produce an item on school duplicator.
3. Children study relationship of school duplicator to offset printing in industry.
4. Children study career opportunities in offset printing industry.
5. Some children experiment with gelatin duplicating in class or at home.

II. Tools, Materials, Supplies

office duplicator (arrange for use with office secretary)
gelatin duplicator, Hektograph, 9 x 12 pan, $3.15
gelatin refill for above, $1 per pound
pencil, Hektograph, assorted colors, $1.50/dozen
carbon paper, Hektograph, $4 per 100 sheets
paper for printing

III. Steps
1. Use teaching aids to describe offset printing (show samples)
2. Have office secretary demonstrate use of duplicator
3. Create design or prepare material
4. Prepare master
5. Transfer master to gelatin or set up machine
6. Print copies
7. Clean gelatin or machine
8. Prepare copies for use

IV. Summary & Evaluation

Ask children to consider if communication served its purpose—carried the message. Discuss the process to see if children understand it. Question the children about offset printing in industry.

V. Things children can make as part of their experimentation

classroom newspaper	menu
instructional materials	puzzle
collection of poems	safety poster
collection of stories	letterhead
gift wrapping paper	notepaper

picture to color	cartoon
script for a play	tickets
recipe for food	greeting card
program	invitation
calendar	announcement
place cards	sheet music
place mat	election ballot

Papermaking

I. Objectives
   1. Children study charts and samples of commercial papermaking.
   2. Children experiment using pulp to make paper.
   3. Children set up a production line to make paper for a classroom printing project.
   4. Children discuss career opportunities in papermaking industry.

II. Tools, Materials, Supplies

How to Make Paper by Hand. Kit and booklet from Educational Service, Hammermill Paper Company, 1581 East Lake Road, Erie, Pennsylvania 16506.
Pulp (Brodhead-Garrett).
Items specified in above kit.

III. Steps
   1. Use a visual aid (film, film strip, etc.) to study papermaking
   2. Plan use for paper (small sheet)
   3. Soak pulp
   4. Add starch
   5. Dip the pulp with screen
   6. Dry paper
   7. Size the surface
   8. Trim for use

IV. Summary & Evaluation

Have the children compare the quality of their paper with various commercial papers. Discuss the various jobs in papermills.

Bookbinding

I. Objectives
   1. Children observe examples of hard and plastic bindings for books.
   2. Children experiment with various binding techniques.
   3. Children utilize a simple binding process for their classroom printing project.
   4. Children discuss career opportunities in bookbinding industry.

II. Tools, Materials, Supplies

hand drill and straight shank twist drill
printed matter to bind
cardboard or heavy paper for covers
paper punch
Elmer's Glue-All

III. Steps
   1. Collect samples of commercial binding and analyze them
   2. Collect materials for binding
   3. Design type of binding children can use
   4. Bind material

IV. Summary & Evaluation

Have children discuss merits of different types of bindings. Help children consider types of work done in a commercial bindery.

SOURCES OF SUPPLY

1. Industrial arts shops in the junior or senior high school.
2. Local hardware store
3. Local office supply store
4. Local school supply house
5. Local art or hobby supply

6. Brodhead-Garrett Company, 4560 East 71st Street, Cleveland, Ohio 44105.
7. Dick Blick, P.O. Box 1267, Galesburg, Illinois 61401.
8. Industrial Arts Supply Company, 5724 W. 36th Street, Minneapolis 55416.
9. Sax Brothers, Inc., 207 North Milwaukee Street, Milwaukee, Wisconsin 53202.

FOOTNOTES

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Dr. Gilbert is a professor at Northern Illinois University, DeKalb, Illinois. Mrs. Thome is a classroom teacher from Paul Dunbar Development Division, Dallas Independent School District. The children participating in the demonstration were from Mrs. Thome's class.

ACIAS

American Council of Industrial Arts Supervisors

Accountability in Industrial Arts Education

Robert L. Woodward

Educational accountability and industrial arts are a winning combination if the performance objectives developed do not shortchange the inherent values of the industrial arts instructional program. Teachers of industrial arts find little difficulty in constructing measurable performance objectives that deal with student acquisition of knowledge and motor skills. However, many of these teachers under pressure to develop objectives ignore the other important values of their courses because of the difficulty in designing suitable objectives that cover changes in attitudes, interests, and values, and the development of appreciations.[1]

Though the various systems of educational accountability have many worthy purposes, the primary intent is to weigh the financial cost of each course/program against the importance and degree of achievement of the stated objectives. At first glance, the assumption might be that this is simply a budgetary procedure handled by a school system's business office, but when it is understood that the justification rests upon student achievement, the administrator or supervisor may be held solely responsible; however, it is usually the teacher who becomes the anchor man. For this reason, objectives of an industrial arts course must be significant.

Most proponents agree that performance objectives tend to reduce ambiguity in instructional programs, offer a guide for more effective and efficient planning and execution of teaching, and provide an objective, systematic method of measuring achievement.

Critics of educational-accountability systems point out that most objectives, as now written, tend to be trivial, lists of objectives become encyclopedic, and too many objectives involve the lower levels of facts-skills, too few cover attitudes-appreciations. These criticisms apply to many sets of performance objectives in industrial arts; because of the richness of opportunity for student acquisition of knowledge and motor skills—literally hundreds of objectives can be constructed for each course—insufficient care is taken in the selection of significant objectives. The selected objectives must convince students, parents, administrators, school-board members, and other concerned staff and lay persons that the course is important and contributes to one or more of the program/school-system goals.[2]

A measurable performance objective contains the components of <u>who</u> (group or percentage of students), <u>what</u> (description of performance), <u>when</u> (specified time span), and <u>how</u> (proficiency level and method of measurement). The objective specifies the group or percentage of students who should attain a given level of performance, describes the results which are strived for through performance of a particular activity or group of activities, presents the period of time within which the objective is to be achieved, and states the criteria and method of measurement to be used in evaluating the success of the activity (though this may not always be possible or desirable).

Over a two-year period, a school system provided in-service training on educational accountability. At the conclusion of this training, the teachers were asked to develop sets of performance objectives. Teachers were assigned to school-system-wide teams according to the courses they taught. The industrial arts teacher responsible for courses in Introductory Woods prepared six objectives. One of these objectives was designed to cover all students enrolled in each introductory woods course: "To have no major injuries during the duration of the class while using both hand and power tools." The other five objectives began with the phrase: "60% of the students shall be able to..."

Usually, industrial arts teachers provide individual instruction and offer an educational program that results in a measure of success for the vast majority of their students. Yet in the five objectives just mentioned, the interpretation might be that only "60% of the students" will succeed, 40% will fail. Though objectives should have substance, they also should be reasonable. The degree of an objective's fulfillment should rest on the measurement of the students' achievement, not on a highly restrictive percent of students covered by the objective. For example, in another school system, the industrial arts objectives were designed for 90%, 95%, or 100% of the students (depending upon the particular objective); however, minimum student-achievement standards were set to meet or exceed a 75%, 85%, or 95% level of proficiency. Even with the best-laid plans, an objective, through no fault of the teacher, may not be fulfilled due to conditions that limit the range, level, or method of operations (constraints).

Generally, objectives specify the desired performance of students and deal with minimums, averages, or terminal performance. The measurement component of an objective determines the degree of students' success, as well as whether, or to what extent, the objective has been achieved. Methods of measurement include teacher tests, standardized tests, observation, and judgment.

An example of a major course objective, covering all the components previously described, that can be used for any area of industrial arts is:

> Ninety-five percent of students completing the course will be able to identify and use 20 hand tools and five pieces of power equipment in a manner that will meet or exceed the minimum standards of proficiency set for the introductory level.

In this cognitive-psychomotor objective: (1) the word "identify" denotes the describing (reporting), orally or in writing, of the names and purposes of the tools and equipment; (2) the word "use" denotes the demonstrated use of the tools and equipment; (3) the types of equipment could be named; (4) the "minimum standards of proficiency" are determined by the school system's teachers responsible for teaching the industrial arts area and level designated by the objective or by the individual teacher—in all cases, the "standards" are tempered to reflect the ability level of the students in a particular class/course; and (5) the industrial arts area of the introductory course (Level I) would be specified. This objective, designed to cover Introductory Metals (Level I Metals or Metals I), is stated:

> Ninety-five percent of the students completing the course will be able to identify and use 20 metalworking hand-tools as well as the brake, buffer, drill press, grinder, and shears in a manner that will meet or exceed the minimum standards of proficiency set for Introductory Metals, Level I.

Often, an objective builds upon the performance/activity described in a preceding course-level objective. For example, the number of hand tools and pieces of equipment as well as the minimum standards of proficiency are increased for Level II courses. Most sub-areas of each industrial arts area provide content for at least one major course objective. A sequence of major course objectives for metals in the sub-area of welding is: Level I, describe welding processes and perform spot welding at the Introductory Metals level; Level II, describe welding processes and perform spot and oxygen-acetylene welding at the Basic Metals level; Level III, describe welding processes and perform spot, oxygen-acetylene, and electric (arc) welding at the Intermediate Metals level; and Level IV, describe welding processes and perform welding operations using all (available) welding equipment at the Advanced Metals level.

In certain instances, objectives are designed for all students enrolled in the course and the performance level is aimed at 100% success. An example is an objective dealing with safety:

> One-hundred percent of the students will demonstrate their awareness of the safe and correct use of tools, machines, materials, and processes while engaged in course activities by maintaining a record of no serious accidents throughout the duration of the course.

This affective-cognitive-psychomotor objective has a criterion of 100% achievement. The phrase "their awareness of" is concerned with "safety consciousness"—the attitude/conduct of students while engaged in activities. The term "serious accidents" covers the policy of required, reportable accidents set by a particular school system.

The value of an industrial arts course is best illustrated and educational accountability is well served by a set of performance objectives that describe major activities and are measurable. Between six and ten objectives are needed for each course (at each level) that treat across-the-board knowledge-motor skills and attitudes-appreciations, each important sub-area, as well as current instructional changes and experiments.

FOOTNOTES

(1) The three domains of performance objectives are affective, cognitive, and psychomotor: (1) the <u>affective</u> covers interests, attitudes, values, and appreciations; (2) the <u>cognitive</u> deals with recall or recognition of knowledge and development

of intellectual abilities and skills; and (3) the psychomotor is concerned with motor skills.

(2) A goal is a statement of broad direction, general purpose, or intent. It is general and timeless and is not concerned with a particular achievement within a specified time period. An objective is a desired accomplishment that can be measured within a given time and under specifiable conditions. The attainment of the objective advances the system toward a corresponding goal.

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Pittsburgh's OVT Approach to Integrated Instruction

Jerry C. Olson

The purpose of this presentation is to look at several of the components which comprise Pittsburgh's industrial education program and to determine how they, along with other disciplines, are blended together to form an integrated instructional program. Program components in an integrated system will be examined as well as several curriculum areas. Particular emphasis will be given to the integrated sequencing of programs ranging from kindergarten to grade 14. Throughout the presentation, the areas of the OVT approach that appear to be synonymous with career education philosophy will be identified.

The specific role of industrial education, as it relates to the process of learning, encompasses many functions—namely, consumer, occupational/technical, cultural, social, and economic. An understanding of these functions along with the implementation of an expanding research and technically-oriented society have a great bearing on how the individual perceives his role as a student and ultimately as a wage earner. To provide an integrated instructional program, it is essential that flexibility become a key ingredient in a formal educational system typified all-too-often by rigidity and formality. Public school systems must become involved in changing students' behavior; one way of doing this is to perceive each student as an individual. By combining the personal/social dimensions of the individual with the results of tests, indicators from past performance, and by using counseling/learning methods, individual diagnosis and flexible programming can occur.

Pittsburgh's comprehensive plan for an instructional program designed to serve each individual student's needs includes mainstream instruction, specialized instruction, and specialized program help. Each is designed to lead to successful performance. It is felt that the vast majority of students can be served in mainstream instructional programs if certain components in the teaching-counseling sequence can become operational. Some of these will include: individual counseling systems; career information retrieval systems; computerized scheduling; teacher-advisor programs; student social-environmental programs; demonstration-unit models; individually-prescribed instruction; simulating and gaming techniques; integrated instructional systems; automated library systems; information retrieval systems; computer-assisted instruction; closed-circuit TV instruction; multi-media instruction; individual study carrels; single-concept visuals; and programmed learning. It will mean also that teachers will be compelled to examine the teaching process more closely, particularly as it relates to the following areas of self-evaluation: summarizing, observing, classifying, interpreting, criticizing, imagining, hypothesizing, and collecting/organizing data. The examination of teacher-counseling methods and of changes in the teaching process, we think, will lead to expanded efforts in innovation. The innovation process is defined as the identification of varying combinations of methods contrived to solve specific problems in the school system.

History has revealed that a very small percentage of educators become labeled "innovators" or even "early adapters." Implementors of an integrated instructional program must weave their way through the maze of observing and classifying simple processes and then, by forecasting and experimenting, pump the new ideas into a revamped implementation model. This requires much creative thought, ability, and perseverance to combat literally hundreds of reasons why others think an idea shouldn't be implemented. Many innovators fall short of this objective because of resistance from men typified by Mr. Magoo, who had the following to say about the writing machine (the typewriter) when invented in 1834: "It will never work; people will go blind looking for the right key." There are many management functions within this network of activities. In my view, they fall into the three major categories of policy, methods, and human relations. The factors that differentiate the take-charge innovative decision maker from the others are his emotional stability, intellectual capacity, and the relations he generates with others.

Decision making is the key to the management process of developing integrated instruction. The process follows a systematic sequence that leads to action and ultimately produces outcomes. The actions that are essential include the analyzing of problems; looking at inputs such as ideas, people, and things; examining of procedures that relate to management; solving of problems; observing the quality and continuing productivity of the system; and finally, making an objective assessment or evaluation of the over-all process. Key personnel of each institutional setting are responsible for fulfilling the operational and management functions of integrating program components and including industrial education as a viable part of the system. In Pittsburgh we looked at commonalities of program content for the purpose of clustering educational programs, determining spin-off levels, evaluating licensure/employment alternatives, and identifying continuing education possibilities.

The process became operational as a result of the comprehensive educational philosophy that was adopted in the early 60's in Pittsburgh. The backdrop for any comprehensive education is the academic program. Superimposed over this is the flexible program of OVT that expands, contracts, adjusts, and adapts to fit the needs of the students. OVT (Occupational, Vocational and Technical Education) extends into the elementary school, K to 5, although specific programs have not been implemented in these grades to date. In grades 6, 7, and 8, teams of teachers with competencies in industrial arts, home economics, and business education provide exploratory experiences for students. In grades 9 through 14, the program allows for narrowed exploration and skill development in broad areas of science, health, home economics, business, agriculture, and trade/industrial education. The program continuum provides a series of planned experiences with realistic activities that allow students to react in the following ways:

Pre-school	- making observations
K to 5	- building chains
Grade 6	- becoming involved with identification
Grades 7 & 8	- responding
Grade 9	- studying concepts
Grades 10, 11 & 12	- looking at principles/structures; developing skills; and solving problems in any major cluster grouping.

In the elementary school and in grade 6, four major components run through the OVT exploratory experience: economics, production, communication, and human relations. In grade 7, boys and girls together explore each of the following areas for approximately four weeks each: construction, manufacturing, power and transportation, visual communications, merchandising, clothing and textiles, foods and nutrition, business communications, information processing, and home/health/community. Eighth grade students make choices by responding to the areas they liked and/or achieved in. They continue their pre-planned experiences in the areas of their choice. Decisions made at the conclusion of the 8th grade will allow the student in grade 9 or 10 to continue his explorations in a more detailed manner. In fact, he may begin to focus in on career objectives and to develop skills in program clusters of his choice. The skill development components are primarily reserved for grades 10, 11, and 12 and extended into the 13th and 14th years in the broad cluster areas of: construction, machining and processing, transportation, graphic communications, electro-mechanical repair, personal, family and health, distributive systems, and information systems.

The activity cone of experience allows students to participate in broad-based exploratory exposures at the beginning and gradually focus on specific skill-centered areas or life careers near the completion of his formal high school education. Whereas, the development cone allows students with a minimum amount of sophistication about the world of work to expand as they participate in new experiences. There is a continuing sequence of planned activities and experiences that the student gets from kindergarten through high school and, in fact, continuing through his adult life.

Decisions plus action comprise the leadership role envisioned for supervisors. Students, teachers, methodology, and activities must be put together in unique ways to be worthy of the title, "an integrated instructional program." It is clear that the many components of an educational institution invite multiple program configurations for integrating varied instructional patterns. The educational enterprise generally, and the industrial education profession specifically, look to supervisors to provide innovative in-put at the developmental stage and to apply their true leadership abilities at the implementation stage.

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California Returns Vocational Education to the Secondary Schools

Robert L. Illinik

California, long the leader in the structuring of education in the junior college mode, has discovered that all that glitters is not gold. Vocational education, primarily a function of the junior college since the early 1950's, is being systematically returned to secondary schools, commencing with the eleventh grade. The medium of re-establishment is a type of school programming referred to within the state as Regional Occupational Centers and Programs. Elsewhere in the United States, the concept has been primarily known as Area Vocational Programs, but leave it to the Californians—they have an innovative twist of their own.

Development of regional schools within California has been undertaken by the educational leadership of the state for the essential purpose of expanding the occupational preparation capability of the state's public schools. In recent years, legislators, the public, and even major segments of the educational establishment have become aware that schools are not adequately serving many or even most of the population. National leadership has been examining the apparent and defined purposes of the secondary schools and has found them falling behind the changes in social and economic requirements of existence in twentieth-century America. Informed leaders throughout the United States are saying that training of people to work is neglected by our educational system. Schools, for the most part, do precisely what they are designed to do—they prepare students to successfully enter the next level of education, even though it has been estimated that more than 80% of the fifth graders do not ever appear in a class in the third year of college.

While realization has been growing throughout the country that secondary education needs modification, very little agreement as to direction of change has been forthcoming. Statistics on manpower needs and surpluses have drawn attention to the really small number of basic job categories which engage the bulk of our population. It has been said that 90% of the male workers are employed in only 90 job categories and 90% of the female workers in 45 categories. School curriculum makes little or no attempt to define its objectives in terms of the skills and knowledge common to this reasonably small number of occupational variations.

Since World War II, the secondary schools of California have changed the emphasis of their curricula to general education intended to meet the common needs of all students. Prestige factors, encouraged by parents and educators alike, have resulted in increased emphasis on college-preparatory and transfer programming—education for education's sake. Without pointing the finger of blame, it is becoming painfully obvious that the most fundamental common need of all has been almost totally ignored by most school districts. Young adults need to be economically self-sufficient soon after high school graduation, regardless of future plans for additional education.

The economics of school operation suggest that this developmental drift toward academic programming is probably not a sinister plot to weaken the economic capability of our nation. Inevitably, the failure to produce qualified, satisfied workers will reduce the quality of life for all Americans. Pressures of increased population, inflation, and over-extension of the property tax as a basis of school support are threatening the economic existence of older generations while vastly reducing the flexibility and variety of school programming and activities. At the present time, the very presence of 80% of the student population has become a significant factor in the support of an educational program aspired to by a majority of students and parents but of lasting value to only the less than 20% who properly should be focused on college and university preparatory programs.

Large segments of our population yet believe that a golden future lies in store for the college graduate, because he is a college graduate. This is true today only if the higher education has provided skills and knowledge demanded by business, education, and government. Another side to the problem is less recognized but increasingly reported by leaders such as Congressman Pucinski of Chicago, Illinois, who points out that youth unemployment in the 16-to-25 age group is frequently as high as five times that of the adult population. The congressman also noted that as many or more students completing high school practical arts programs graduate from college as do students with a secondary foundation in the traditional college-preparatory programs. It is becoming profoundly apparent that a college education no longer must be restricted to a study of the liberal arts but will have a bigger payoff when structured for higher education leading to competencies in the practical arts. Studies of the progressive education movement in the United States during the 1930's suggest that success in high school is an appropriate indicator of success in college, regardless of the specific pattern of courses taken. Certainly, academic skills contribute to college success; however, those skills can be developed while mastering basic knowledges in useful occupational clusters.

The trend in business and industry has been toward a specification of precise capabilities by the hiring hall, though an increasing mass of students have been funneled into more general school programs, especially at the secondary level. Graduate students, in contrast, frequently find themselves focused so narrowly, and in such depth, that employment prospects are exceedingly limited. Experience in the practical aspects of a discipline is frequently bypassed. Increasing numbers of educators are becoming aware that students can learn everything they are presently being taught in compartmented, subject-matter-oriented courses—while participating in hands-on, practical job-oriented training sequences designed to provide occupational, entry-level capability. This is a re-orientation of secondary school course content. The order of instruction would become a matter of creating practical awarenesses to be used as hooks on which to hang information and theory. Such an approach could enable students to graduate from high school with a diploma in one hand and a salable skill in the other.

How has our educational system arrived at its present state? In California, prior to World War II, the incorporation of vocational training availability in the local high school was not unlike that found in most states. During the 1950's, however, a sort of policy decision was implemented with the tacit concurrence of the public, labor, business, and the majority of educators. Basically, the philosophy adopted said it would be advantageous for children to stay in school two more years. Occupational training would be provided to those who wanted it during those extra years. Two things then occurred in the process of implementing this concept: vocational education courses were gradually shifted out of high schools, and a system of more than 90 junior colleges was created.

The developing junior college system adopted a three-fold role: first, to provide terminal programs of occupational education; second, to provide college transfer programs, thereby lightening the load for state colleges and universities in the lower-division classes; and third, to provide a second chance (educationally) for those persons who failed to achieve necessary competencies in their secondary school programs. In time a priority emphasis became established in the two-year colleges, partially because of higher costs associated with some of the more technical offerings and partially as a result of student demands, including returning Korean veterans, for more remunerative labor market entry capabilities. College transfer programming and remedial class offerings vastly outnumbered opportunities for occupational preparation. The junior colleges, now known as community colleges, further accelerated the institutional emphasis away from occupational entry capabilities as they opted to identify with higher education. This action completed the separation from a tenuous relationship as a part of secondary education. There is some rationality in concluding that the fiction of being a part of the secondary system was maintained until this time to justify the use of Federal vocational education moneys—awarded prior to 1963 only to schools of less than college grade.

Following the passage of the Vocational Education Act of 1963, the role of secondary schools in California vocational education has once again been implemented. Elsewhere in the United States, developmental impetus has been focused on post-secondary vocational programming at the 13th- and 14th-year levels. Increased variety and specificity in labor market needs, combined with soaring high school dropout rates within California, caused considerable attention to be given to manpower training needs. Welfare rolls were expanding and remedial manpower training efforts were being frustrated by products of the local systems of education compounded by poorly-trained recent arrivals from other states. Increased labor mobility had now become a national problem. Evidence multiplied that competently trained persons were in the minority of those migrating to the Golden State. The changing complexion of urban living, plus growing numbers of turned-off, disenchanted high school students has refocused developmental efforts of social planners, politicians, and educators on the need to change secondary school programming. The attempt to postpone occupational training until the 13th and 14th years of school has not worked for the vast majority of California youth.

Many reasons have been advanced for such an educational failure, but it is likely due to a basic social reason—the country's youth are demanding social and economic independence at an earlier age. Unfortunately, past educational efforts have created products intellectually, but not economically, ready to assume the new roles. It is certain neither management nor labor took into consideration this change in the aspirations of youth when they advised the public, the schools, and each other. Recommendations extending over a period of more than a quarter of a century focused on the idea that specific vocational training should be provided by the entrepreneur or the craft association or both, but not the schools. However, industry did not train enough people in fundamental skills. Labor all too often established training levels for apprenticeships at recession levels of employee needs. Neither labor nor the entrepreneur have been overly anxious to inform the schools as to the constitution of needed skills and competencies. To the extent such communication failed—so did the reality of industry/education partnerships. Worse, communications broke down within the business and industry sector. Top management did not keep its employment and personnel divisions informed that the generally-educated product of schools established with the advice and counsel of industry leadership was to be preferred over skilled and experienced workers. Employment department preferences remain, for most hiring, attuned to experience.

School administrators accepted management proclamations in support of general education and found such programming to be most consistent with continued university entrance requirements which have dominated the curricula of the American secondary school most of the twentieth century. Education concentrating on practical roots as a basis of curriculum design virtually disappeared from the scene, and the general programming lost meaning and relevance to the real world. Students did not associate what they were learning with the real world of work. And why should they? Even when facilities and equipment and practical courses were offered, the equipment and methods were likely to be totally obsolete. Almost nowhere have equipment-depreciation and replacement schedules been established. Obviously, school operation costs can be kept lower if they do not have to reflect too closely the actual practices of the business or industry for which they are training.

And finally, teachers (occasionally whole faculties) were becoming victims of a system which honored academic excellence but attached little or no value to the practical experiences of the work-a-day world. Instructors have predominantly gone from school (as a student) to school (as a teacher) with only a minimum exposure to the vast variety of payroll opportunities to be found in private enterprise. Most experience was obtained in casual, more or less incidental encounters of a part-time or short-term nature rather than purposeful experiences in the process of earning a living.

By 1964-65, the California legislature became concerned over the reduction of occupational training opportunities, especially the lack of involvement of minority group youth. National success stories in the development of area vocational schools had not gone unnoticed. The junior colleges were not considered to be the appropriate vehicle at this time. Minority group leadership, in particular, did not want to have economic independence withheld for additional years. Furthermore, it was realistically appraised by most interested parties that the academic approach incorporated into much of the college occupational offerings was not appropriate to the needs of students who were not making it in academic-type classes. The opportunity offered by the 1964 legislature to create countywide vocational schools was ignored by county superintendents. There was not one taker. Legislative changes in the intervening years have made it possible for two or more districts to combine their efforts by means of a joint exercise of powers agreement. A growing involvement of districts and counties has been the result. Organizations ranging from shared departments to independent semi-districts have been created.

WHAT IS AN ROP/ROC?

Regional Occupational Programs and Centers are "a means whereby vocational, technical, and occupational educational opportunities can be extended through a wider variety of specialized courses to serve a larger number of students than can be provided adequately, efficiently, and economically by a single district" (State Plan for Voc Ed Part I p. 83). It is the legislature's intent that such programming be made available to four general groups of residents within the participating districts or region. These are high school students, graduates, out-of-school youth, and adults. A unique feature of the laws which provide for this specialized occupational programming is a provision mandating a minimization of duplication of effort between existing agencies providing vocational education. These agencies include adult schools, community colleges, high school, and private schools. Further, the instructional emphasis of an ROP/ROC is limited by law to development of marketable, entry-level skills, upgrading, and retraining for occupations identified by job-market analysis.

It also seems apparent that the legislature anticipated assistance by existing state organizations to ROP/ROC agencies. ROP/ROC organizations are defined as supplemental to existing capabilities. There are also no less than two laws which specifically identify the California State Department of Human Resources Development as a major source of information and a participant in labor-market surveys. Congress has shown an awareness of the need for manpower training to be tied to a better knowledge of manpower requirements. The WIN amendment, HR 10604, would establish labor-market advisory councils to provide training-need information.

The fact that fifty state education chiefs expressed their support of the proposals for enlarged career education emphasis in schools (K-14, proposed by U.S. Commissioner of Education, Sidney Marland, Jr.) points out that vocational education is no longer standing alone but should rather be regarded as an idea whose time has come. Yet public apathy still exists. Many people have come to believe vocational education is that part of the educational system established for students who cannot make it in college or in the academic world structured for them as general education. They are treated as second-class citizens. Such impressions must be altered.

Even more alarming, however, is the spectre of opposition from the educational establishment who increasingly expresses weariness at the use of schools (as traditionally evolved) as scapegoats for society's faults. Proponents of change in the nation-wide school curriculum are emphasizing that all education is inherently vocational and that general education, as presently constituted, needs revision from the sterile, irrelevant base on which it is constituted. Economic capabilities oriented by providing occupational entry-level skills are the most common general need in evidence today. These recommendations are advanced from a study of the products of general education over the past twenty-five years and an analysis of the difficult, if not impossible, job manpower agencies have faced in trying to remedy the faults discovered.

Regional occupational programming in California can and should serve as a buffer to buy time while the prevailing general education emphasis is rearranged. The concept of sharing efforts in a participating region for some technical occupations or crafts with limited job markets makes good economic, as well as educational, sense. The cause for comprehensive education in the high schools of tomorrow cannot be damaged by the development of a supplemental agency for specialized vocational education available to all students. ROP/ROC's extend the opportunity for the development of instruction leading to the achievement of success patterns built upon successful reception by the world of work, with optional step-off points at which occupational experience can be gained prior to continuation of the education process. Drop-out philosophies of education, inherent within the concept of general education, have no place in the future of education. So-called rejects of the academic education structure have time and again returned to school with little or no difficulty in completing even advanced graduate work. Significantly, Governor Reagan of California recently signed into law a bill submitted by the legislature which provides that all graduating high school students should have a salable skill.

Bill Green, assemblyman from Los Angeles and chairman of the Subcommittee on Vocational Education of the Assembly Committee on Education, sponsored a resolution commemorating Vocational Education Week in February 1971, which stated that only 10% of all jobs required a four-year college degree. Yet, according to Leland Baldwin, vice-chancellor of the state's community college system, 80% of all students coming to the two-year colleges declare themselves for the transfer program. He also notes that it is regrettable that only 20% actually continue to a four-year school. For at least 60% of these who elect to continue their education via the community colleges, economic self-sufficiency is still an elusive vamp. There must be some agency within public education which has as its sole purpose the preparation of motivated persons for the occupation of their choice.

Regional programming for specific occupational preparation objectives is made financially possible by means of a special override tax with restrictions limiting its use to the provision of vocational education and specified supporting services when conducted under specific guidelines. Districts in California thus have placed at the disposal of their educational programs a potential of more than $810 million for development of occupational competencies by high school students. No stigma is attached to participation under provisions of the Education Code. In fact, student competition for program entry has been the rule rather than the exception. Involved students and their parents have supported and applauded reality as opposed to fiction in education. Curriculum content relevant to qualification for business and industry entrance standards is commonplace. Maximum program flexibility in order to accommodate minor changes in employment requirements and availability is standard operating procedure.

No less than 38 regional cooperative operations had been organized throughout the state by January 1972. At least five more are in the "hopper." Students in these classes are required by law to come from two or more "home school" attendance areas. Youngsters often travel more than two hours per day in order to take up to three hours of special training in addition to the three or four hours of classes in their home school. Graduation and transcript records are maintained by the home school. ROP/ROC programs replace most electives in these students' school programs.

Regional programs are prohibited from offering academic subjects—they must confine themselves to skill development and directly related instruction. Recent legislation has made it possible for participating students with transportation problems to attend a three-hour minimum day in their home school at no financial penalty to their districts—by dropping the physical education requirement. Although many regional programs are limiting their attentions to high school students, this is not the case in general. Fifty-three percent of all enrollment throughout the state is in non-high school categories, including adults, graduates, and the high school drop-out. Success of many of this latter category has added fuel to the fire that they are in reality "push-outs."

Limitations in present laws withhold classification of these regional operations as separate independent districts, as was done in New York State. Legally, districts may permit student participation when the regional operation is conducted by two or more districts jointly. When the operation is under the auspices of the County Superintendent of Schools, all districts must permit such attendance. Graduation credit is, theoretically at least, at the discretion of local school administrators who may or may not allow credit toward graduation. Administrators in many of the regional operations report that some of their counterparts in community colleges, adult schools, and high schools view the ROP/ROC operations as threatening, and expressions of insecurity and feelings of being threatened are not uncommon. ROP/ROC administrators have found it expedient to establish a special-interest association which will hopefully become a division of one or more of the existing administrative associations.

There can be no doubt that vocational education is on the move again in California with the broadest base of support yet. Regional programming is considered by many to be a valuable aid in the further development of a comprehensive secondary school system. The danger remains that such regionally-developed operations can be used as a smoke screen to protect the existing academically-oriented schools until the public once again turns its attention to other matters. University influence in high school curriculum content has weathered storms before. Management and labor may yet take a stand on their vested interests in control of the size and makeup of the labor market.

Perhaps there can never again be enough work to go around, but many people do not believe it inevitable. Too many things need to be done to provide adequate environmental management. Medical care is reported to be inadequate for vast segments of our population, and desirable services are nowhere adequately staffed. Personnel shortages in the allied health fields are approximately equivalent to the surplus of teachers being graduated. The social and economic structure of the United States is at stake. The battle to provide adequate economic capacity for all citizens is part and parcel of the need to keep our economy expanding. The clash of ideology between full employment and a welfare state has been joined by a wider segment of the social and political structure.

This is the way it is! The solution must be a cooperative effort by all educators with the support of labor, business, industry, and the many publics they serve, to turn around the system. High school leavers, graduates and otherwise, need the capability of economic viability without closing the door to further academic preparation. Perhaps it is time we once again started asking our pre-schoolers what they want to be when they grow up. When did you last hear a child respond positively to that question?

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Russian Technical Education

Kermit A. Seefeld

Technical education in USSR is offered in ten-year secondary schools, professional technical schools, special technical schools sponsored by industry, apprenticeship training in industry, and polytechnical institutes. The latter is higher education with emphasis on professional education rather than skill training. Pioneer and youth organizations as well as parent committees contribute to the technical education program.

DEFINITIONS

Technical education is defined as learning activity both manual (skill) and intellectual (concepts) particular to art, science, or industry. Vocational education, which may be technical, is a learning experience which prepares students for useful employment. A technician is one skilled in handling tools and instruments in the performance of a task requiring expertise both manipulative and cognitive.

It may be assumed that the terms "industry" or the "economy" will encompass all of the specialized fields of manufacturing, construction, transportation, communication, agriculture, and services such as health.

The policy of politechnical education in USSR is based on the fundamentals of industrial production. It is not to be confused with trade training, which prepares the student for entering and succeeding in the world of work. It is a program which might be termed general education aimed to expose children to production in industry and agriculture.

VISITS TO TECHNICAL SCHOOLS

Secondary School Number 16 in Riga is a typical technical school devoted to preparing young people as seamstresses or tailors. Six hundred and thirty girls and six boys attend the school.

All students were given stipends (scholarships), the amount determined by need and grades. One hundred of the students boarded at the school. All were furnished clothing (uniforms) and meals.

One third of the curriculum is devoted to technical education. Students attend sewing classes (and related theory) two days per week, and three days are given to academic studies. All students take classes in biology, chemistry, physics, mathematics, language, literature, and art. Extra-curricular activities such as choir are available. Thirty-six hours of classes are offered each week.

It was difficult to judge the age of the building. Maintenance is sometimes neglected for emphasis on teaching. It is questioned whether the building was designed and constructed as a school. Most laboratories were very small. Fifteen stations were provided for chemistry in a room half the optimum size.

Textbooks were used for all courses. Comments were made expressing the wish that textbooks could be made available to relate theory and practice.

School Number 16 was sponsored by an industrial plant. Hardware as well as advice, counsel, plus work experience opportunities were provided by the sponsoring industry.

Lectures on the operation and function of sewing machines were correlated with physics. Commercial machines as well as regular were used.

All classrooms and laboratories were well provided with overhead projectors, movie projectors, and teaching aids attached to walls. Many of the aids were made of plastic, sometimes illuminated from the rear. Some of the equipment was operated from a console at the teacher's desk.

Teachers seemed to be highly motivated. Each year one teacher in a building is honored as the outstanding instructor. The person is selected by his peers, and the success of the teacher's students is taken into consideration.

Clothing designed and made at the school was modeled in a style show by five girls and one boy. Items produced by the students can be purchased for the price of the material. If it is not purchased by the student, it is offered for sale to the public.

Classrooms were visited where students were present. However, no students were reciting or participating in any activity during the visit. Students stood when the tour arrived and usually remained standing until we left.

After finishing an eight-year school, students may study for three years at a technical school.

Both the professional technical schools and the secondary vocational schools are almost meeting industrial demands. However, the 24th congress has planned for an expansion in both programs and has increased the stipends offered to students in these programs. The percentage increase was not to encourage more students to join the programs, although they were too low by comparison with other programs. It can be assumed, however, that a percentage increase in student support may accelerate the program.

We were also privileged to see other technical education facilities. A drawing laboratory was equipped with drafting machines which looked as if they had been made by students in a technical school. The room was spacious, as judged by other observed standards, with seating facilities for approximately thirty students. A metal laboratory was equally spacious and well equipped for hand metal instruction. Display boards were mounted on boards attached to the walls. A machine metal laboratory was well equipped with not only general machines such as the engine lathe but jig boring machines and special milling machines as well.

We observed a technical school which specialized in electricity and electronics. Special attention was given to the preparation of skilled labor, and particularly skilled technicians for the telephone industry. Central control panel installations plus ample testing equipment enabled students to secure industrial experiences in the school laboratory. Elaborate visual aids were demonstrated. Visual aids and classroom electrical equipment were produced for other technical schools. These items were constructed as students learned theory and developed skill.

MANPOWER REQUIREMENTS

It is understandable that the philosophical base for USSR education should be the teaching of communistic morality and the "love of labor." It is also understandable that vocational technical education should become a very important aspect of their educational program. Their industrial economy requires many capable people at all levels of the industrial program. A pyramid of manpower identifies the educational problem. Every engineer requires three to six technicians as support people. Each technician requires a similar number of skilled laborers. For each skilled laborer, three to six machine operators function, and each machine operator is supported by common labor. Mass production, automation, and computer-controlled machines have eschewed the pyramid, but the relative concept remains. It is difficult to think of the engineer and common laborer as being equal. The humanistic approach can. Communism may also, but by a different rationale.

The distribution of manpower dictates a vocational education system to meet the needs of business and industry. Obviously, schools should respond to the need for huge numbers of technicians as well as engineers.

TEACHER PREPARATION

Unfortunately, the teachers of technical education in secondary schools are less well qualified pedagogically than their colleagues. They are usually graduates from secondary technical schools who have had experience in industry. Surely the most capable and efficient are selected as teachers, but they lack the pedagogical institute or university preparation required of other secondary school teachers. Pedagogical institutes exist for the preparation of teachers of health, physical education, and other special areas of study, but not for the teachers of technical subjects. Theoretical information such as applied math and science is taught in technical schools by teachers who are academically qualified. A problem exists. One wonders how the math teacher can adequately teach applied math without experience in industry. It may be too much to expect secondary students to make the application of theory to practice.

Technical education teachers are further victimized by their exclusion from the refresher courses offered to regular secondary teachers every five years. They are also disenfranchised in terms of pedagogical extension courses. The only possibility for further pedagogical training would be to pursue higher education via correspondence and extended day programs. The technical teacher is further victimized in that his industrial experience takes time, which may take him past the age of 35 years, after which he may no longer enter higher education. Secondly, technical teachers are students of objects rather than theoretical concepts and as a result may find conventional higher education very difficult. Educators in the USSR admit that something must be done to adequately prepare technical teachers. Special pedagogical institutes for the preparation of technical teachers may be the answer.

OBSERVATIONS

Russia's educational program, not unlike other nations, is plagued by a hierarchy of respectability. The less intellectually capable are relegated to education in vocational technical programs. The USSR, however, has taken steps and achieved progress on the problem of equal status, probably in greater measure than other nations. At one time in the past, all secondary students were required to take technical classes. Courses were required for (1) general education—all citizens of Russia are to have an understanding and appreciation of each other's contribution, particularly the efforts of the person doing common labor, (2) vocational preparation for the world of work, and (3) character building—good citizenship is achieved by manual and intellectual work experience.

Evidence does exist that less emphasis is placed on vocational technical work than in the past. All secondary students need not take technical work. However, all secondary students do take technical drawing. It is assumed that the thrust of this course may be mechanical engineering drawing or the language of industry, which can be written and read but not spoken.

In defense of the program and students taking technical vocational education, one should be cognizant of a different type of mentality rather than a degree of intellectual ability. Some people (and they are in the minority) enjoy handling abstract concepts. Others who falter with the symbolism of mathematics may possess profound insight in assembling, maintaining, and even suggesting design innovations on a machine. Multiple stimuli (seeing, feeling, etc.) enable this type of person to succeed. It is hoped that USSR has recognized both types in the continuum. It could be that this concept is an important step in achieving a classless society.

Technical education in the USSR is planned for and is succeeding in achieving stated goals.

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Engineering Technology: A Comprehensive Technical Program on the High School Level

Raymond Morrison and Horace Gambell

For two years at Los Alamos High School we have been teaching a new course: engineering technology. Fifty-six boys took it last year. Fifty boys and two girls are enrolled this year, with an additional ten boys working on individual projects as second-year students.

The course is a new concept in industrial arts. It is designed for the high-school-aged boy or girl who is concerned with our technological society and their future role in that society.

In its broadest scope, engineering technology is a curricula of mathematics, science, drafting, shop courses, and English—all related as closely as possible to modern industrial application. The students apply the concepts and formulas of physics, chemistry, and math of learn how and why things work. They study testing procedures, materials testing, power sources, and the technology involved in space exploration, environmental studies, and nuclear energy research.

With the advent of rapid technological advance, pressures from science, and more emphasis on academics, many prominent individuals in industrial arts have assumed the task of course innovation.[1] This was evidenced from researching ten years of literature in the industrial arts field.[2] Paul DeVore[3] and Delmar Olson,[4] for example, have written and spoken about the current explosive technology and the resultant implications for industrial arts;[5] yet the movement has accomplished scant change. More elaborate equipment, more tools, and different materials have made entry into the industrial arts laboratories, but the programs remained non-technically oriented.[6]

Mr. Stanley M. Brodsky, chairman of the division of technology, New York City Community Co..ge, in a recent speech pointed out four major deficiencies of our society: the lack of technological content in secondary school curriculums; insufficient information about technological information and careers; the development of early negative attitudes toward subjects like mathematics and science, which deter those who may be capable of excelling as technicians; middle class pressures toward baccalaureate programs.[7]

The Bureau of Labor Statistics projections indicate that there will be a 56% deficiency of needed technicians by the year 1975.[8]

Little has been done in the average high school to add technology or technical areas to existing programs; and it is here, we believe, that industrial arts can make a contribution to general education.

The engineering technology course at Los Alamos High School gives the student extended practice in using the scientific method to study our technological environment. He or she participates in a laboratory situation which simulates the technician's environment. Here they learn to run tests, do research, experiment, write reports, do individualized study on selected projects, and evaluate present technology through systems analysis and analytical practical problems.[9]

The following is the outline of the engineering technology course.

I. Testing and Report Writing
    A. Basis for Scientific Research
    B. Operation of a Test Facility
    C. Collection of Data
    D. Evaluation and Interpretation
    E. Reporting Results
II. Precision Measurement in Industry
    A. Length
    B. Force
    C. Time
    D. Temperature
    E. Pressure
    F. Flow
III. Materials Testing (The Properties of Solids, Liquids, Gases)
    A. Solids
        1. Density
        2. Stress and Strain
        3. Hardness
    B. Liquids
        1. Hydrostatics
        2. Pressures and Sp. Gr.
        3. Hydraulics
        4. Viscosity and Volatility
    C. Gases
        1. Characteristics of gas
        2. Pressures
        3. Pneumatics
IV. Mechanics of Force and Motion
    A. Force
    B. Motion
    C. Vectors and Analysis
V. Work, energy, and Power
    A. Work
    B. Forms of Energy
    C. Power
    D. Simple Machines
    E. Torque

VI. Heat and Effects
    A. Change of State
    B. Transfer
    C. Heat Engines
VII. Magnetism (Electromagnetism and Electricity)
    A. Basic Electricity and Magnetism
    B. Electric Motors and Power
    C. Generators and Power Distribution
VIII. Atomic Energy
    A. Atomic Fuels
    B. Reactors
    C. Heat Exchangers[21]

The general study program presents the student with related information about science, math, English, and technology and how they work together. In addition to the general study outline, which involves only one-third of the student's time, he will spend the other two-thirds in actual laboratory experiences. Each student performs twenty selected experiments to understand how scientific principles are controlled to result in useful designs.

LABORATORY EXPERIMENTS—ENGINEERING TECHNOLOGY

1. Length Measurement - 5 class hours
   Use of metric and English systems for linear measurement with rule, protractor, vernier calipers, micrometer caliper, telescopic gauges, hole gauges, and dial indicator.[10]
2. Force and Mass Measurement - 3.5 class hours
   Use of metric and English systems for mass measurement of gravity, inertia, mass, torque, shear, tension, compression, and centrifugal force.
3. Time Measurement - 1 class hour
   Use of time for proper procedures in sequencing and accurate time measures.
4. Temperature Measurement - 3.5 class hours
   Use of basic definitions of heat and temperature: Fahrenheit, Centigrade, Kelvin, and Rankin. Exercises performed will acquaint with use of liquid in glass, bimetallic, pressure spring, and resistance measures for recording.
5. Pressure Measurement - 3.5 class hours
   Exercises will acquaint with pressure techniques of indicator by Bourdon tube, diaphragm gauge, resistence charge, manometer, and conversion in the English and metric systems.
6. Flow Measurement - 5 class hours
   With the units provided, experience will be afforded in rate of flow, viscosity, density, pressure, velocity, laminar flow, and turbulent flow. English and metric conversion will be experienced.[11]
7. Thermal Conduction - 5 class hours
   How heat flows through a conductor. Different conductors will be used along with poor conductors and insulators.
8. Thermal Convection - 5 class hours
   How the heat is transferred from a heated surface to the air at different air velocities.
9. Thermal Expansion - 3 class hours
   How materials expand and contract when heated.
10. Air to Air Heat Exchange + (Air to Liquid) - 4 class hours
    How hot and cold air exchange their properties in separated chambers. Air to liquid is also explored. Relationships of surface area, air velocities, temperature differences, and heat transfer.
11. Liquid to Liquid Heat Exchange - 5 class hours
    How heat travels from the hotter liquid to the cooler liquid. Relationships of temperature differences, liquid flow, and parallel flow are explored.[12]
12. Electric Motor Analysis System - 5 class hours
    Use of a dynamometer, with various electric motors, the AC/DC, universal and three phase motors, to name a few, are evaluated for total energy in and total energy out.[13]
13. Solid Fuel Rocket Test System - 3 class hours
    Rocket thrust and drive can be plotted to evaluate solid rocket fuels. Thrust, specific impulse, exhaust velocity are evaluated as functions of the operation.

14. Fuel Cell Test System - 3 class hours
An elementary study of the conversion of chemical energy to electrical energy. Spacecraft operation depends on this force of energy production.
15. Solar Cell Test System - 1 class hour
A study of conversion of light energy to electrical, a force of energy used in many unmanned spacecrafts.
16. Thermoelectric Generator Test System - 1 class hour
Use of conversion from thermal energy to electrical energy. Uses conductor materials to produce the current flow.[14]
17. 4-Cycle Engine Analysis Module - 5 class hours
A small engine dynamometer is used to analyze the results of input charges to the engine under varying conditions. Fuel and air flow are fully controlled to ensure a positive result for the experiment.
18. Wankel Engine Analysis Module - 5 class hours
The principles of the rotary engine can be analyzed under controlled conditions with the use of the dyno system.[15]
19. Fluid and Hydraulic Power Systems - 6.5 class hours
Using erector set concepts with fluid components, circuits are built and experimentation data recorded to give an understanding of flow, pressure, etc.
20. Pneumatic Power System - 5.5 class hours
Erector set concepts are used to instruct through construction of pneumatic circuitry and operation. Pressure and vacuum sources make up a variety of experiments the students can do to gain a clear understanding.[16]
21. Tensile and Bending Tests - 3 class hours
Tests are run on various calibrated metal samples to determine the strength and hardness characteristics. Tensile and bending testers are used in conjunction with hardness testers to characterize and draw definite conclusions about materials.
22. Technical Instrumentation System
The concepts of instrumentation and process control are studied to give background in the industrial processes and quality control. The program expands the theory of pneumatics, electronics, and physics in application and operation of simulated industrial operations.[17]
23. Fluid Mechanics Lab Module
Separate experiments are constructed with this laboratory to demonstrate the use of different fluid principles. Pipe friction, constriction meters, hydrostatic pressure distribution, weirs, open channels, centrifugal pump, and impulse turbine are some of the experiments done.
24. Automotive Evaluation Control Systems
Instrumentation permits quantitative measurements between R.P.M., torque, and horse power. Various engines can be compared to specifications. Controlled conditions can be induced to acquire specific data.

The first six experiments in Basic Measurement are required before any others are allowed to be pursued.

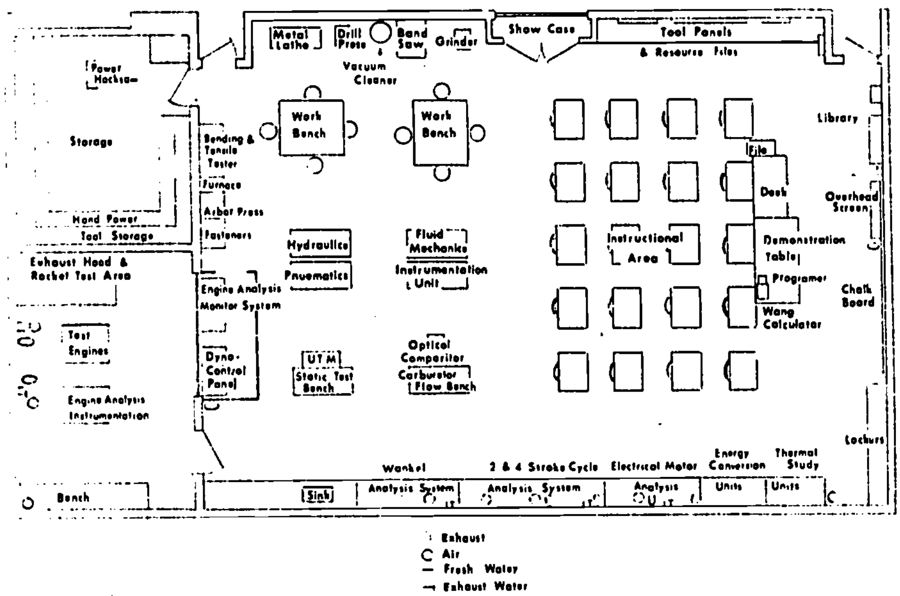
The facility used at Los Alamos High School is shown in Figure I. Figure II shows the laboratory as it was originally proposed in 1969.

A listing of the major equipment includes the following:

1. Basic Measurement Units (available in kit form)
   - A. Length Measurement
   - B. Mass and Force Measurement
   - C. Pressure Measurement
   - D. Temperature Measurement
   - E. Flow Measurement
   - F. Time Measurement
2. Thermal Principle Units (experimental devices available)
   - A. Thermal Conduction
   - B. Thermal Expansion
   - C. Thermal Convection
   - D. Air to Air Heat Exchange
   - E. Liquid to Liquid Heat Exchange
3. Energy Conversion Units (experimental devices available)
   - A. Solar Cell
   - B. Thermo-electric Generator
   - C. Fuel Cell
   - D. Solid Fuel Rocket Test Stand
4. Electric Motor Analysis Unit
5. Wankel Engine Analysis Module
6. 4-Cycle Engine Analysis (Supplemental engines, diesel, and 2-stroke cycle)
7. Fluid Mechanics Bench
8. Hydraulics Test Bench
9. Pneumatics Test Bench
10. Instrumentation Test Bench
11. Wang Calculator and Programer

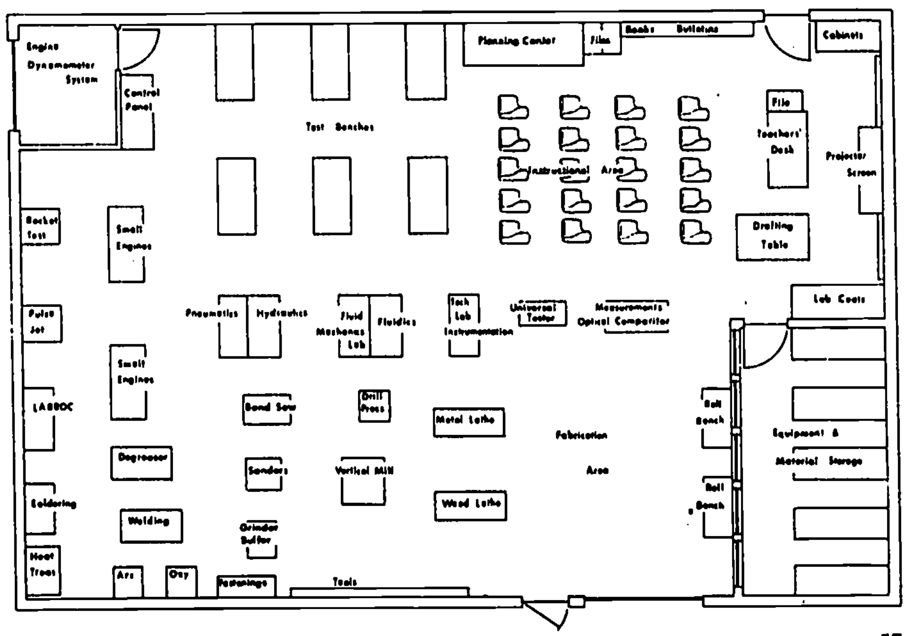
ENGINEERING TECHNOLOGY LABORATORY

LOS ALAMOS HIGH SCHOOL LOS ALAMOS, NEW MEXICO



ENGINEERING TECHNOLOGY LABORATORY

(A NEW INDUSTRIAL ARTS FACILITY) 40' x 60



12. Automotive Test and Dyno-control System
13. Engine Monitoring and Analysis System
14. Universal Testing Machine for Tensile, Compression, Hardness, and Bending Measurements
15. Optical Comparitor
16. Welding Equipment (oxy-acetylene and arc)
17. Parts Cleaner (beads blaster or solvent tank)
18. Lathe - 10 in. or larger
19. Drill Press
20. Band Saw (metal cutting)
21. Grinder
22. Power Hack Saw
23. Arbor Press
24. Two 4-Place Work Benches
25. Twenty Drafting Tables
26. Static Test Bench

The equipment listed represents a capital outlay of approximately $40,000.

As enthusiasm for the engineering technology course continues, it attracts those students with aspirations toward becoming engineers, scientists, laboratory and technology specialists, and even those who are exploring the fields. Although few girls have enrolled in the course to date, teacher, administrators, and school board members have expressed encouragement that they recognize this program as being one means of exploring interests in the service fields as lab technicians, nurses, and other applied scientists.[18] The course is not intended to prepare students for immediate employment. The course emphasizes the need for continued training either by employers (on-the-job-training), two- and four-year technical schools, or a four-year college program in the sciences or engineering.

The writers of the course looked for ways to stimulate interest in technical industrial courses. The nature of the Los Alamos working community was evaluated. It became evident that students would be interested in learning about the kind of work their fathers are doing in laboratory situations. From this idea came the inspiration to teach applied science in the framework of modern technology. There is no reason to believe that these interests and needs are unique to Los Alamos.

The engineering technology course is well on its way through the second year with what is believed to be a very successful program. For example—students taking the course last year were pre-tested and post-tested by an evaluation containing a pre-assessment of the course objectives. The students demonstrated a 53% gain in knowledge about technology; that is, a 53% increase in the mean of the post-test scores as compared to the pre-test scores. The post-test showed an increase of 22% in appreciation of our technological world and a reduction in confusion about it. This year, to prove more conclusively that the course is not taking credit for knowledge acquired from other courses, a random sampling of students not enrolled in engineering technology have been pre-tested in addition to the enrollees. The total group will be post-tested for comparison.

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ACIATE

American Council of Industrial Arts

Teacher Educators

Information Utilization in Industrial Arts Education

David H. Miller

Whether you consider yourself to be a teacher or a researcher (or both), you are faced with an ominous information problem. Of course, the problem is compounded if you if you are conducting research about teaching or if you are teaching about research because you not only are expected to keep abreast of research reports and journal articles in your research area, but also of the instructional materials and other products of research related to classroom or laboratory teaching.

Literally thousands of books, research reports, journal articles, texts of speeches, and sets of instructional materials are published each month (and the list could go on and on).

What is needed is a systematic method of organizing all of this information, in its various forms, so that it can be identified and located in accordance with our ever-changing demands for information in seeking answers to educational problems. What I am talking about is an information system, a structured procedure for providing access to information. It is difficult to distinguish between the elements of an information system and the system itself, for who is to say that a systematic method of providing access to information related to industrial arts education shouldn't be a part of a larger network for the practical arts or for all of education. The "system" I am talking about is but one component of a larger informal information network for education. This larger network, of course, would comprise the universe of information subsystems for education when these can be seen to have resulted from some systematic planning. For example, one subsystem could lie in whatever systematic means you use to access information from journals that are central to industrial arts education or to vocational-technical education.

The mind's picture of an information system may call up memories of the kindly, but stern, librarian or of a monstrous computer spewing out reams of paper while lights flash and tape reels whirl. For some, information may mean data; for others, it may mean documents. This presentation describes a document-based information system, making available and accessible many of the relevant research findings and instructional materials that have been developed in education during the past few years. A large number of these research reports and sets of instructional materials have to do with industrial arts education.

Most educators soon become aware of the need for a retrieval system as soon as their personal collection of documents exceeds a hundred or so. Keep in mind that one information system for education is accumulating documents at the rate of 1000 documents each month, that this same system is keeping track of 500 journals, and that it is utilizing some new techniques.

This information system is user-oriented. That is, the system exists for the purpose of meeting its users' information needs. The services made available by this system may include finding information, loaning equipment, or permitting search of its files. The framework has already been developed. I am asking you to implement it.

This document-based, user-oriented system is linked to other larger systems in an informal network which takes advantage of all the efficiencies and effectiveness of the larger system. One of these larger systems is ERIC, the acronym for the Educational Resources Information Center. It is ERIC's purpose to make available to the educational community the valuable research and related material which might otherwise remain unknown to it. ERIC's ultimate goal is a network that will link universities, professional organizations, school systems, and boards of education. The idea is to speed research results and curriculum materials to places where they are needed. The ERIC system should help you, regardless of your position.

Redently The Center for Vocational and Technical Education conducted a study of over 3200 vocational-technical educators in seven states. It was found that few local educators had knowledge of, or effective access to, this system. There was much evidence to indicate that they needed it and wanted it, but because of their circumstances they depended on nearby, convenient, and friendly sources of information, even at the expense of satisfaction or authenticity. Perhaps, to some extent, they have been intimidated by memories, visions, or recent experiences. The point is, they need and can have most of the authentic research and instructional materials on their own doorstep through a local, document-based, user-oriented, linked system.

Many of you are doubtless aware of Dr. David Jelden's efforts at indexing and making available to users the many doctoral dissertations in industrial arts education. This work helps to fill a major void in industrial arts education's informal information linkage system between the large body of usable, relevant material and the potential users of this information.

The U.S. Office of Education established a number of clearinghouses. Each clearinghouse is responsible for a different topic in education, and each seeks out the literature in the area of its specialty. The ERIC Clearinghouse on Vocational and Technical Education is one of 20 ERIC Clearinghouses. Its scope includes agriculture, business and office, distributive, home economics, health, technical, and trade and industrial education, industrial arts education, manpower economics, occupational psychology, and occupational sociology. The ERIC Clearinghouse on Vocational and Technical Education is a division of The Center for Vocational and Technical Education at Columbus, Ohio. Some of you may already have visited us at 1900 Kenny Road at The Ohio State University.

WHAT CAN BE EXPECTED OF AN INFORMATION SYSTEM?

The major objectives of an information system are to make information both available and accessible. The ERIC system makes information available by seeking, acquiring, processing, analyzing, and disseminating it in the form of information products. Basically, these products can be classified as access products, secondary products, and primary products. For your local information needs, you will want to overcome the temptation to start with primary products and instead concentrate on access products. Access products will provide accessibility to many secondary and primary products at an extremely low cost.

Access Products

The ERIC Clearinghouse on Vocational and Technical Education produces four access products. The first is Abstracts of Research Materials in Vocational and Technical Education (ARM). In 17 quarterly issues thus far, it has provided indexes to and abstracts of nearly 6000 documents and evaluative criteria. A companion to ARM is AIM, or Abstracts of Instructional Materials in Vocational and Technical Education. It has provided, in 17 issues, indexes to and abstracts of 3379 instructional materials such as teachers' guides, student guides, tests, curriculum guides, and course outlines. The third access product is a computer tape which contains the abstracts and which can be searched rapidly and accurately by computer to find the documents relevant to a precise need. A fourth access product is soon to be released in the form of a series of specially-compiled editions containing all of the AIM document resumes from Fall 1967 to Fall 1971. These editions will be printed by subject area, and an edition will be available which contains only industrial arts materials.

All of the ERIC Clearinghouses input documents to Research in Education (RIE) and cite journal articles for Current Index to Journals in Education (CIJE). RIE announces 1000 documents each month, and over 500 journals are covered by CIJE each month. All of these are made available on computer tape.

These access products are all available at relatively nominal cost on a subscription basis. The paper indexes can be used by nearly anyone willing to read. The computer tape requires suitable computer software with which to search the tape. But this is only the beginning! Nearly every document announced is available in full text from the original source or from the ERIC Document Reproduction Service. Obtaining all of the documents isn't impossible either. Microfiche, a 4 x 6 in. film card with up to 70 pages of text, brings the entire collection within reach of many school districts. For many of you, much of this information is not new. Your local school district or university library probably already has most if not all of these access products. But do you utilize these products? For those of you who don't have this capability, let me assure you that you can have it and at a low cost.

Secondary Products

Although usually available in the basic collection on microfiche, secondary products have a special usefulness. They provide a synthesis or interpretation of the literature in the main collection. The ERIC Clearinghouse on Vocational and Technical Education has produced two "Review and Synthesis of Research" editions for industrial arts education. James Buffer has been commissioned to develop a review and synthesis of research on industrial arts for students with special needs. Other information analysis products of interest to industrial arts educators are "Industrial Arts Curriculum Improvements: A Change Agent's Guide"[1] by Emmett Mason, and Daniel Householder's "Review and Analysis of Curriculum Development in Industrial Arts Education (in press)".[2]

Primary Products

Most information systems will acquire primary products almost inadvertently. As the collection grows, a system is needed to make this collection useful. At The Center, our collection has grown to over 15,000 volumes, and we can share some ideas on how to manage such a collection.

Access to Information

Using access products such as ARM, AIM, and RIE is a relatively simple process. The user may find a title by looking in the subject, author, or institutional index. Relevant titles lead to the resumes which permit you to see an abstract of not over 200 words describing the document or providing information about its contents. Only after this "narrowing down" does one need actually to read the document, and then it is generally available on inexpensive microfiche which files neatly and which can be found readily.

Of course, it is necessary to have a means of reading microfiche, and many readers are on the market. A reader-printer permits one to make a full-size copy of any page on the microfiche. In fact, the microfiche itself may be reproduced. There are several versions of the reproducer.

WHEN WOULD ONE USE AN INFORMATION SYSTEM?

You may ask, "When would I use all of this?" A study of 3200 educators revealed that they are spending an average of 16.3 hours per month searching for information. This is fully 10% of their working time. Naturally, researchers were spending more time at it, but even local teachers were spending over 12 hours a month in searching. Think of the potential for saving time or improving the yield for these vital personnel!

The first use of the system is to obtain information to solve a problem or make a decision. Now, we know that all problems aren't solved and all decisions aren't rational, but we would like them to be. This usually requires a one-time search of the system. The ERIC access products can provide a wealth of information with a minimum of effort. With this capability, there is little excuse for "re-inventing the wheel," and there is plenty of opportunity to "stand on someone else's shoulders."

HOW TO CONDUCT A SUBJECT INDEX SEARCH OF ERIC ACCESS PRODUCTS[3]

An information system can be utilized in solving a search problem. Suppose you need to gather information on the topic, "measuring achievement in vocational-technical education." Let's say you need information for an upcoming graduate education seminar in which you are to take part in a panel discussion; or possibly that you are a teacher in a secondary school or college and that the principal or department chairman brought up the subject at a recent faculty meeting and that you spent the last twenty agonizing minutes of the meeting silently praying that you would not be asked to speak on the subject! Most of us know the feeling well.

At any rate, you have an established need for learning more about the subject than you now know. You may be able to learn enough about the subject in question from one or more of your colleagues. You may find, however, that they know no more about the subject than you do. Let's look at some of the resources available to you for gathering information on the subject.

Your library has a card catalog system which might lead you to the information you want. It includes subject, author, and title sections that can direct you to books within your particular library.

The Readers' Guide to Periodical Literature is another possible source. It contains bibliographical data similar to that found in the card catalog. The Readers' Guide, however, is not limited to periodicals contained in your library. Let's look at some other possibilities.

The Education Index lists bibliographical data on periodicals that fall within the realm of education. This reference tool is available in most college libraries but may not be available in secondary school or public libraries.

Dissertation Abstracts is another possible source. It includes abstracts of doctoral dissertations from major universities and also lists the availability of individual full-text dissertations.

A computer-based system, DATRIX, is also available for accessing abstracts of dissertations in this collection.

Any of these reference tools may yield enough literature on the subject of measuring educational achievement to satisfy your immediate needs.

In fact, the use of all these reference tools in locating literature on the subject should ensure a fairly comprehensive search. However, a number of limiting factors underscore the need for a more systematic cataloging and classification scheme. Certainly, each of the reference tools described thus far is valuable when taken alone. Collectively, however, these do not represent a coordinated effort at developing resource materials into a comprehensive information system. There is no "common language" for indexing these publications. Each of these reference tools classifies and indexes documents differently.

ERIC is a national information system comprised of 20 separate clearinghouses, each of which is responsible for a particular educational area.

Each clearinghouse in the ERIC network monitors current significant information that is relevant to the scope of interest of that clearinghouse. The information is then acquired, evaluated, abstracted, indexed, and listed in one or more of the ERIC reference publications.

One of the 20 clearinghouses is devoted to vocational and technical education. Its scope also includes the related fields of manpower economics, occupational sociology, industrial arts education, and occupational psychology. Documents processed by the ERIC Clearinghouse on Vocational and Technical Education are likely to include specific information on our problem, "measuring educational achievement." A central ERIC facility coordinates the processing of documents by the separate clearinghouses and also assembles ERIC reference publications and makes them available to users. Thus, in the event that the topic under consideration also falls within the scope of other clearinghouses, this information would be available in a Central ERIC reference publication along with reference information supplied by the Vocational-Technical Clearinghouse.

To enable researchers to obtain abstracts and full texts of documents, ERIC has established the ERIC Document Reproduction Service (EDRS). EDRS supplies copies of documents in two forms:

(1) Microfiche (MF) - 4 x 6 in. sheet of microfilm on which up to 70 pages of text are reproduced. (Note that use of a microfiche requires a microfiche reader.)

(2) Hard Copy (HC) - reproduction of the document on paper.

Information on availability of documents, i.e., ERIC accession code number, source of original document, number of pages, cost, date of publication, and a complete bibliographic citation for each processed document is included in the ERIC reference publication in which a particular document is indexed. Now, since our problem is related to education, it is within the scope of ERIC. One or more of the following ERIC reference publications should contain bibliographic data on our subject. Research in Education contains resumes which highlight the significance of research and research-related reports and current research projects in the field of education. A resume is comprised of an abstract and its accompanying bibliographic citation. The resumes are numbered sequentially in the Document Resume Section.

The indexes which follow the resumes in each monthly edition cite the contents by subject as well as by author or investigator, institution, and accession number.

Another ERIC reference publication is Current Index to Journals in Education. This publication contains bibliographic data on journal articles from the over 500 educational and related journals which are regularly reviewed by the 20 ERIC clearinghouses. Current Index to Journals in Education contains indexes of these journal articles and announces the journals' availability. The Subject Index is comprised of the descriptive terms assigned to each journal article main entry.

The Main Entry Section contains bibliographic data on each indexed journal article.

This data may include only the title of a particular article when this information is deemed as sufficient for describing the article's contents. In some instances, however, a brief annotation is also provided.

The indexes which follow the Main Entry Section in each monthly issue of Current Index to Journals in Education (CIJE) cite the contents by subject and by author. A third index, the journal contents index, simply lists each journal along with the particular articles from that journal that were processed for CIJE for that month.

The Thesaurus of ERIC Descriptors serves as the guide for assigning the terms which are used to index the various reports and journal articles which are entered into the ERIC information system.

The Thesaurus is an authoritative vocabulary developed by subject specialists at the ERIC clearinghouses. It can be thought of as the key to the ERIC system's vocabulary, since Thesaurus terms are the terms used to index ERIC documents. All descriptive terms contained in the Thesaurus are based on documents or journal articles previously indexed and currently included in the ERIC system.

The Thesaurus is useful in conducting comprehensive subject index searches of the ERIC reference publications as well as in designing computer searches for locating specific documents within the ERIC system. It can be used to translate the non-ERIC terms into ERIC terms, thereby providing a list of key descriptive terms that can be searched in the subject indexes of any of the ERIC reference publications.

The typical use of the Thesaurus involves generating descriptors for use in a subject index search of one of the ERIC reference products. The first consideration is the development of a problem statement or problem theme. Another consideration in using the ERIC reference tools is the determination of the context in which certain terms are used. The descriptor listing provides an exhaustive list of terms written in "ERIC language." The terms are grouped in such a way as to show the context in which each term is used. The rotated descriptor display groups related terms, lists all the uses of a particular term, and provides multiple points of entry to multi-word terms. The rotated descriptor display then provides a "feel" for potentially relevant terms.

Two ERIC reference publications devoted solely to vocational and technical education may contain information on our topic. They are: Abstracts of Instructional Materials in Vocational and Technical Education (AIM), a quarterly publication which contains abstracts and bibliographic data on materials used by teachers in presenting information to students or material used by students in connection with classroom instruction; Abstracts of Research Materials in Vocational and Technical Education (ARM), another quarterly publication of the Vocational and Technical Education Clearinghouse, includes abstracts and bibliographic data on research and research-related documents.

Both AIM and ARM include, with the abstracts, information on the availability of copies of the full-text documents from which the abstracts were developed.

Let's carry our search problem through to the identification of specific documents from one of the key ERIC reference publications, Research in Education. In order actually to conduct a subject search, we will need to add a degree of specificity to our problem statement.

Let's say that a school system is interested in implementing a comprehensive career education program. A committee has been asked to explore alternatives to the traditional methods of measuring educational achievement and to recommend specific types of tests that would be appropriate for the career education program. The nature of career education requires that some alternative to traditional norm-referenced achievement measures be investigated. If you were assigned the task of supplying this information, how could ERIC help?

One method of obtaining such information is to search the professional literature on this topic. ERIC provides reference tools for locating relevant documents. These documents might take the form of research reports, bibliographies, sets of instructional materials, critical reviews, or other reports of various types. Depending on how much in-depth searching is needed, you can follow several routes, using the various ERIC tools. For the purposes of this example, the September 1970 issue of Research in Education is used.

Examine the problem. State the problem clearly and as concisely as possible. The resulting statement might be worded as follows: Explore alternatives to traditional methods of measuring educational achievement.

Examination of the problem shows that relevant information could be obtained by locating literature on the broad topics "measurement" and "achievement."

First check the Subject Index in order to determine that the terms taken from the problem statement are in fact "ERIC terms." In the event that a term from the problem statement cannot be located in the Subject Index, the Thesaurus of ERIC Descriptors can be consulted and key terms translated into ERIC terminology. Identify the entries beginning with the term "measurement" in the Subject Index. A check in the Subject Index under "achievement" yields another list of terms. It can be assumed that document resumes which list both the terms dealing with "measurement" and "achievement" as descriptors will be highly relevant to the search problem.

A simple worksheet can be developed which can be used to identify pertinent abstracts. ED 038 670 can be seen to be a potentially relevant abstract, since it is indexed under both "achievement" and "measurement." The resume of "Some Limitations of Criterion-Referenced Measurement" includes several potentially relevant descriptors which might also be searched in the Subject Index for additional documents.

The terms "achievement rating," "evaluation methods," and "test construction" can be checked in the Subject Index for additional resumes related to the problem. However, considerable attention should be given to the selection of descriptive terms used in searching the subject indexes of ERIC reference publications. Two or three key terms may provide access to enough document citations to allow a "feel for the literature" related to a specific problem. Problems that are stated vaguely or in extremely general terms may require that a considerable amount of literature of a peripheral nature be reviewed before documents related specifically to the problem can be identified.

The list of descriptive terms identified from the worksheet can be revised and used to guide in "narrowing down" the potential bibliography to particularly relevant documents. Armed with the list of descriptors generated by means of the procedure just described, all that remains is to search the subject indexes of the various ERIC reference publications (a procedure that is as simple as using an ordinary telephone book).

Thus, the search for documents dealing with "measuring educational achievement" has yielded one highly relevant reference, ED 038 670. In a manual search, it is important to recognize that documents should only be considered when they meet the criteria for selection as specified in the problem statement. While this search strategy yielded only one "on target" abstract, it is important to recognize that the September 1970 issue is only one of 65 or so issues of RIE that could be searched manually in a comprehensive search.

After pertinent abstracts have been located and reviewed in Research in Education, the availability of full-text copies of the documents must be ascertained. Documents indexed in Research in Education are generally available either through the ERIC Document Reproduction Service or as indicated in the availability line included with document abstracts in the document resume section.

The availability line EDRS PRICE MF-$0.65 HC-$3.29 indicates that full-text reproductions of the document are available from the ERIC Document Reproduction Service (EDRS) in either of two forms:

1. Microfiche (MF) - 4 x 6 in. sheet of microfilm on which up to 70 pages of text are reproduced. Note that a microfiche reader is required in order to use microfiche.
2. Hard Copy (HC) - reproduction of the document on paper at the original size.

When ordering copies of documents cited in previous issues of RIE, always consult the most recent edition for current price and address, as these are subject to change.

In general, full-text copies are available only by ED number.

When documents are not available from EDRS, another source of availability is cited.

The major differences in the various ERIC reference publications are differences in the types of documents covered rather than differences in format. In general, only a brief orientation is required in order to gain a working familiarity with Current Index to Journals in Education, Abstracts of Instructional Materials in Vocational and Technical Education, and its companion piece, Abstracts of Research Materials in Vocational and Technical Education.

FOOTNOTES

(1) Emmett Mason. "Industrial Arts Curriculum Improvements: A Change Agent's Guide." Columbus, Ohio: The Center for Vocational and Technical Education, The Ohio State University. May 1971. (VT 012 875, see March 1972 RIE).

(2) Daniel L. Householder. "Review and Analysis of Curriculum Development in Industrial Arts Education." Columbus, Ohio: The Center for Vocational and Technical Education, The Ohio State University (in press).
(3) The information contained in this portion of the presentation was taken from a preliminary draft of an instructional package on the use of the ERIC system. The ERIC User Training Package which will be available in late 1972 is being developed to train prospective users of ERIC access products. Included in the package is a slide-script set which presents an overview of the ERIC system and illustrates how to formulate various information search strategies. Also included is a series of student exercises which allow students "hands-on" experience in using the ERIC access products. The exercises utilize the problem-solving approach. Evaluation units are also under development.

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Man & Technology at Indiana State University

Donald P. Lauda

In the 1970's, American education is facing its most trying times. Even more important than diminishing budgets, decreasing enrollments, and in some cases the elimination of complete programs, is the need to meet the criterion of social adequacy. Nevitt Sanford (p. 17), editor of American College, has stated:

> The American college, and American institutions of higher learning generally, are embedded in our culture and in our society. They are expressive of persistent trends, and persistent conflicts, in the American value system, and they have a diversity of important functions in society. This means that fundamental or widespread change in the colleges can come about only when there is a shift of emphasis in our general system of values or when there is a change in our general societal processes.

In spite of such statements which have been proclaimed for decades, general education at most universities seems irrelevant to the majority of students. We are all too aware of the attitude of students toward those courses which have no apparent relationship to their program, especially in the technical areas. Johnson (p. 188) has stated that although general education courses could be the center of curricular change, they continue to languish because liberal studies have been subverted by the academic disciplines. The traditional philosophy of general education, which is based upon the theory that all knowledge is sequential and that a certain body of knowledge marks the educated man, merely perpetuates the mutation of educational reform. This distributive plan, which has been with us for too many years, is probably due to campus politics rather than to intellectual invention.

With these challenges in mind, Indiana State University inaugurated an experimental program in general education. This new program is based upon six assumptions:

1. The program has been designed as an experiment in educational philosophy.
2. The program has been structured for a cross section of the typical entering class.
3. General education should be a continuous part of a four-year curriculum and not truncated at the end of the sophomore year.
4. Academic advisement is most effective when integrated into course work.
5. Close teacher-student relationships will be emphasized.
6. The program is not compartmentalized but directly related to the student's specialized interest.

With these assumptions in mind, the program was developed on an experimental basis to incorporate the following pattern:

INDIANA STATE UNIVERSITY
THE NEW GENERAL EDUCATION PATTERN (EXPERIMENTAL

College Year	1st Semester	Hours	2nd Semester	Hours
Freshman	Ways of Knowing	5	Ways of Knowing	5
	Ways of Communicating	5	Ways of Communicating	5
Sophomore	The U.S. in the Twentieth Century	5	The U.S. in the Twentieth Century	5
Junior*	Junior Seminar	5	Junior Seminar	5
Senior	Senior Seminar	5	Senior Seminar	5

UNIVERSITY STUDIES 101-102 "WAYS OF KNOWING"

Ways of Knowing is divided into four five-week periods within two semesters covering physics, art, literature, and political science. This section of the program is team-taught, with each subject having the most qualified professor. The instructors will present basic points of view, methods, and current problems of their discipline.

UNIVERSITY STUDIES 103-104 "WAYS OF COMMUNICATING"

Ways of Communicating is basically speech and English, stressing communicating in our own social setting. Individual interests and self-study are encouraged. Ways of Communicating is a two-semester class.

UNIVERSITY STUDIES 201-202 "THE U.S. IN THE TWENTIETH CENTURY"

This course is also team-taught and analyzes major issues such as the impact of technology upon society and investigates such problems as crime, poverty, and the destruction of the environment.

UNIVERSITY STUDIES 301-302 "JUNIOR SEMINAR"*

Advanced seminars offered by various departments to serve specific needs. Will stress relationship of specialization within a discipline to cognate fields as well as to disparate areas of knowledge. Each seminar will have a central departmental focus.

UNIVERSITY STUDIES 401-402 "SENIOR SEMINAR"

Advanced seminar of a broadly inter-disciplinary kind. The subject matter will be far-reaching and philosophical and will be directed toward broad topics not normally within the purview of a single department.

The reader will notice that the School of Technology at Indiana State University is involved via a 5-semester-hour seminar with the title Man and Technology. This junior seminar is based upon a number of assumptions:

1. The educational system must reflect and influence the society which it services.
2. All students live in a complex technological society and they must be prepared for continuous radical change.
3. Cognitive thinking cannot be separated from affective response.
4. The cluster of diverse procedures which surround the acquisition and utilization of knowledge is, in fact, the highest form of content and the most appropriate base for curriculum change (Parker, p. 1).
5. A technological environment is made up of a host of interrelated parts which involve tangible (material) aspects as well as the intangible (sociocultural) aspects. To study one without the other merely perpetuates the fragmentation of any study of our culture.
6. The predominant value of a subject lies not so much in its accumulated information or in its intellectual artifacts, but in its special way of looking at phenomena, in

*School of Technology Contribution—Man and Technology.

its methods of inquiry, its procedures for utilizing research, and its models for systematic thought (Parker, p. 22).

CONTENT AND METHODOLOGY

The study of the human and technology requires a commitment to a specific body of knowledge. It is the purpose of the course to assist students in accumulating data and recognizing the differences in the data, synthesizing information, and making rational decisions. This is precisely the process that is mandated by a cybernated society. From the first day of class, the learner is encouraged to ask: "What is technology? What must I know to understand the myriad of relationships that are involved? Where is the information found? — and, ultimately, "Who am I and what is my role today and in the future in a society that is evolving through the exponential growth of technology?"

Although every section of the course takes on a different complexion, topics of genuine interest consistently appear with each group. These are:

DEVELOPMENT OF TECHNOLOGY

Growth from the eolithic period into the future
Landmark patents

WORK

Why people work
Leisure
Guaranteed income
Dehumanization

CYBERNATION

Automation
Computers
Invasion of privacy
Capacity and potential
Man-Machine interface

ECOLOGY

TECHNOLOGICAL FORECASTING

Delphi technique

TECHNOLOGICAL ASSESSMENT

ANTICIPATORY TECHNOLOGY

POPULATION AND ITS EFFECT UPON A TECHNOLOGICAL SOCIETY

The Delphi technique for predicting the future has been very useful in this course. This technique provides the student with the opportunity (in most cases for the first time) to look at his future society. Once this process is complete, the student is usually aware of his lack of knowledge about his culture and is motivated to read, engage in dialogue; in other words, pleased to become 'involved' with the process. A repeat of the Delphi technique at the end of the course reveals considerable change in the students' outlook.

Other techniques that are being utilized at Indiana State are:

INDIVIDUAL RESEARCH (Students are encouraged to do research within their major)

FIELD TRIPS

FILMS

GUEST PROFESSORS FROM OTHER DISCIPLINES

SIMULATIONS

SCENARIOS

A host of written materials are available for the course. Most instructors, however, find specific materials to be useful. Some of these are:

THE FUTURIST (Periodical of the World Future Society)

KAISER ALUMINUM NEWS

21st CENTURY FILM SERIES

TEXT: Advancing Technology: Its Impact on Society, Lauda and Ryan, Wm. C. Brown Publishers, 1971

TECHNOLOGY AND CULTURE JOURNAL

TECHNOLOGICAL REVIEW

TECHNICAL SURVEY: A WORLD REPORT ON ADVANCES IN TECHNOLOGY (Published Weekly)

FUTURE OUTLOOK OF THE EXPERIMENTAL PROGRAM

The experimental program has been in operation at Indiana State since 1969 and continues to expand each term. It is interesting to note that 70% of those involved with the experimental program remain in school until graduation, as compared to 50% of the students on the traditional program. At the same time, the CLEP test, which was administered to both the traditional and experimental students, has not revealed any differences in their scores. This dispels the claims by the traditionalists that the experimental program is merely the prostitution of general education. Hopefully, this success pattern will lead to implementation of such a program for all students at Indiana State University.

FUTURE OUTLOOK FOR THE MAN AND TECHNOLOGY SEMINAR

The School of Technology offered one section of this seminar in the fall of 1971, two during the spring term, and will have three sections during the fall of 1972. Student interest is very high and the ETS course evaluation test has revealed that 75% of the students strongly agree that their interest in technology has been stimulated by the seminar. The majority of the students also rate the course as having excellent value for them as an individual. This enthusiasm seems to be inherent in a course that is both viable and relevant in this era of radical change. This enthusiasm "sells" such a course once it is implemented. Hopefully, the School of Technology will be able to open this for all students in the very near future.

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Collegiate Programs in Man and Technology

John R. Lindbeck

There are a number of different examples of course offerings and parts of courses available at Western Michigan University as it attempts to deal with the issue of man and his relationship to contemporary technology. This issue has been discussed and examined and dissected for a number of years, and it would be futile to try to summarize in any way the conclusions and action programs which have arisen from these examinations. I shall move, therefore, immediately to the matter at hand—that is, a description of Western's involvement in this topic at the college level—with one brief prefatory statement. Society, today, is very much concerned with the problems faced by man in a society which is being increasingly pervaded by the technician and his commitment to technology.

My first experiences with this matter came about seven years ago when I was asked to become part of a General Studies/Humanities course called "Arts and Ideas." The purpose of this course was, very simply, to try to explain away the function and appearance of man's art in the twentieth century. There was an obvious need for information on technology for this course to become an accurate statement of the contemporary aesthetic condition. As a consequence, we developed a 40-minute television tape in which we treated the problem of man and technology in an objective fashion. We examined a number of products and processes and suggested ways in which these were so rational as to exclude any human input into their formal qualities. We then extended this line of reasoning to man's entire aesthetic experience and attempted to show how technology did influence man's art.

A second experience consists of a departmental course retitled "American Technology." Here we examine the essentials and elements of mass production, mass produce a product, and identify major achievements in the history of technology; we relate this to industrial education programs in American schools, and we identify current issues related to technology. While this course is a requirement for industrial education majors, we have a number of students from other disciplines who take it for elective purposes. We attempt to make the primary point that the mass production industry, while being a basis for our high standard of living through quantity production of high-quality goods, also has dehumanizing characteristics which can stifle creativity and humanity in mankind.

A third program is a proposed new course entitled "Environmental Design." The purpose is to bring all of the varied courses and instructional expertise to the problem of man and his relationship to the environment. It goes without saying that a study of the technological community looms very important in such a course. Some of the content topics are: elements of design and architecture, elements of planning and systems management, organic design in nature, and surveys of technological innovation. The methodology of the course includes short presentations, questions, and small group programs dealing with such topics as case studies in planning, design, and construction; who designs America; who designs Kalamazoo and Western Michigan University; case studies in interdisciplinary teamwork; and computer applications to design. A most significant activity in this course will be the problems that the students themselves will work on individually or as small teams. Some suggested topics are: superfluous people, suburbia and the intercity, work and leisure environment, consumer products and reclamation, and cultural resistance to design innovations.

I have cited but three examples of the way my university is involving itself with this issue. Universities hold a key position in resolving some of these problems, in that they have at their disposal a great number of persons qualified to lend their expertise to these concerns. Industrial educators should become more involved. This is a horrendous undertaking for one person or one department. It requires the resources of the entire university in order that it may be fully realized.

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A Polydisciplinary Model for Teaching: Man, Technology, and Environments

Rex A. Nelson

The rationale for this course resulted from a study of the many attempts to enlarge learning for the general studies area. Evidently, these attempts are made due to the inadequacy of utilizing courses from isolated, or one-dimensional, disciplines to provide for general studies. Apparently, it is presumed that learners who are seeking their identities, relationships, and purposes will somehow assimilate these single-dimension experiences into usable knowledge about man's existence. Frequently these fragmented discipline courses, in reality, emerge as prerequisites designed for specialized studies within a single discipline.

The polydisciplinary approach in this course is inclusive of major discipline areas. But, more importantly, the course attempts to blend disciplines into an understandable and viable study of man by mobilizing the energies of students, teachers, consultants, and study materials around existing situations facing man. Subsequently, the learners have the opportunity to discover that a unified, rather than fragmented, man is utilizing knowledges to take actions in environments.

PURPOSES

The polydisciplinary course presumes that the best learning occurs in the course of involvement and investigation of experiential situations which are a method of change, not merely a prescriptive or descriptive process. The purposes of the course are to assist learners in: (1) entering a society increasingly in need of broad specialists, who see the theory, data, and application of their individual contributions within the broader context of man's environments, actions, and knowledge; (2) learning how to learn through an experiential process and preparation for meeting the challenge of change and its intrarelationships; (3) relating to man and his environments, actions, and knowledges; and (4) identifying how: (a) they; (b) their future individual disciplines; and (c) situations of man which often appear isolated, merge into the broader context of the realities of man.

METHOD

The method for the course utilizes a matrix for the polydisciplinary study of man as a guide. This matrix (see Figure 1) encompasses three broad areas and twelve elements.

Since this course is designed for the general studies area, the matrix provides a method for assisting learners in identifying situations for experiential investigation which relate to their varied interests, expertise, and desired majors. The matrix is also used by both the instructor and learners to assure that situations selected for investigation are experienced from a polydisciplinary approach.

CONTENT

The polydisciplinary study is not a study of disciplines, but a study of situations of man wherein disciplines merge and wherefrom they emerge and develop. The polydisciplinary approach is an involved and experiential study of the interactions of man in his activities by learners as they seek their identities, relationships, and purposes within the galaxy of man's existence. Therefore, the content of this course is not prescriptive, descriptive, or an accumulation of encyclopedic knowledge. The content of this course evolves from the purposes of the course. Consequently, the content could be described as those situations of man which are presented to challenge the learner who seeks to fulfill the purposes of the course, or the seeking, identification, assimilation, experiencing, and use of knowledge which meets man's demands for action in his environment.

AN EXAMPLE

The following is an example of one situation engaged by a group of students in the class. The situation was identified as transportation in the man-made physical environ-

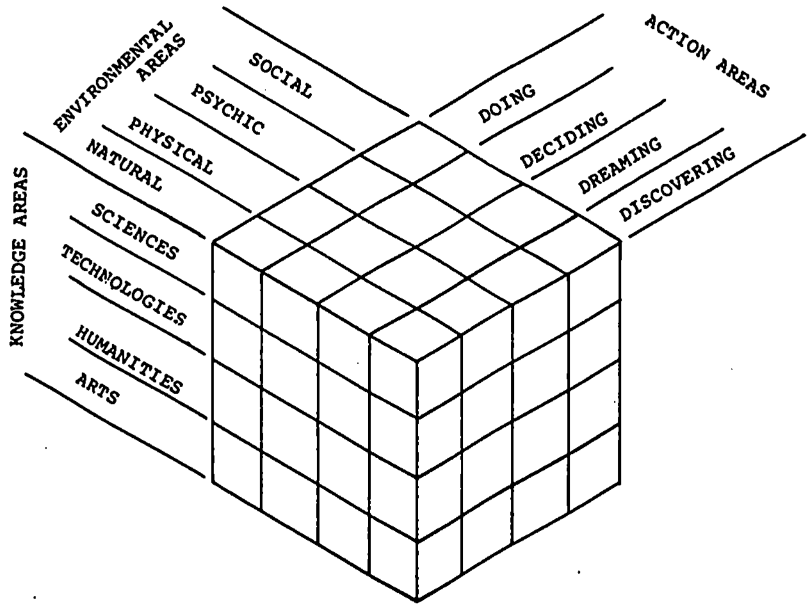

Figure 1. Matrix for polydisciplinary study of man.

ment. One week was utilized in obtaining input for delimiting the situation, identifying and contacting resources, making consultative appointments, and designing the methods and responsibilities for investigation and presentation. This effort resulted in the situation being changed from transportation to Rapid Transit of People and Goods in a Metropolitan Area. MARTA (Metropolitan Atlanta Rapid Transit Authority) was selected as the concrete base for this investigation.

A second matrix was designed to direct this investigation (see Figure 2).

Since the situation, MARTA, was not developed at the time, the matrix provided a graphic guide for a situation where man is taking the action of dreaming about what could be based upon technological knowledge of the man-made physical environment, i.e., rapid transit transportation. The fact that this third-order matrix extended the investigation to the extremities of the matrix assured that the remaining elements were interrelated and considered in the investigation.

A sample question posed for each of the matrix elements (see Figure 1) follows:

I. Knowledge elements (Technology Base)
   A. What are the options (technology) for rapid transit transportation?
   B. What is the level of skill (art) for each of these options?
   C. How do people determine which option (humanities) should be used?
   D. What are the facts (science) known about rapid transit transportation?

II. Action elements (Dreaming Base)
   A. What could be done in rapid transit transportation if barriers were removed (dreaming)?
   B. What research (discovering) is being done in rapid transit transportation?
   C. What are the ingredients involved in making a decision about rapid transit transportation?
   D. What is man doing in situations similar to the one being investigated?

III. Environmental elements (Physical, man-made, base)
   A. What physical capabilities and limits are present in the man-made and non-man-made physical environments for rapid transit of people and goods? (physical)

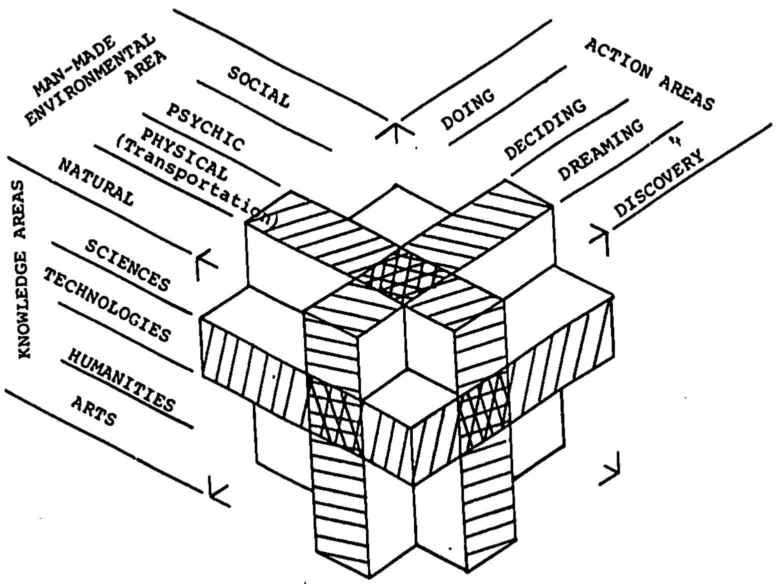

Figure 2. MARTA Matrix.

B. What must be considered in moving people in an urban or metropolitan area? (natural)
C. What types of thinking may cause rejection or acceptance of rapid transit? (psychic)
D. What will be the impact upon the inter- and the intra-relationships of the people living in the area? (social)

These are only representative questions directed by the experiential investigation of the rapid transit situation. Figure 2 graphs only one of the options available in the polydisciplinary approach to the situations and does not illustrate the investigations carried out by three other groups during the same three-week period.

SUMMARY

This paper can only indicate the options available to students who engage a situation from a polydisciplinary base. Students are directed into selecting investigations of situations based in the environmental, action, and knowledge areas. Regardless of the base from which the situation appears to stem, the approach is designed to involve the three areas of man and the intimate personal participation of learners as they learn how to learn, how to relate to the areas of man, and identify how they and their future individual disciplines merge into the broader context of the existing realities of man.

Toynbee described this approach to content when he stated that:

> I had now (1911) found a way of my own for banning infinity. Instead of going on acquiring knowledge ad infinitum, I had started to do something with knowledge that I had already possessed, and this active use of knowledge gave direction, for the future, to my acquisition of knowledge. I would limit infinity by directing my acquisition of knowledge to meet the demands of action. The knowledge was there, at my disposal, stored on the shelves of libraries and in galleries of museums. I need not, after all, be in such a hurry to master it, for it would not run away. I could and would take as much of it as I wanted, when I wanted it, for use in making something with it. In other words, I would acquire knowledge, henceforward, for use in projects of my own, not for the sake of satisfying an imaginary postmortem examiner.

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Technology for Non-Technologists

Robert D. Ryan

We now live in what has been logically titled a technological era. It is called that not because all men are engineers or technicians, and certainly not because all men are cognizant of technology, but rather because we are now aware of the influence of technology upon the twentieth century.

Today, by and large, academecia has neglected the study of the development of technology and its impact on society and culture, which in effect has caused a distortion of our education. Technology is an essential component of our society. In the near past, most disciplines chose to ignore the subject of technology; it was scarcely given more than a passing mention. The instructors who dealt in the areas of industrial education and applied sciences have been, and still are, treated with a supercilious snobbism.

Yet the fact still remains paramount that science and technology are the distinguishing characteristics of our developed civilization. As changes occur at an ever-increasing rate, adaptability must also increase. This then means that adapt—change—aware appear to be the keys to the future in all respects.

Industrial arts, a technologically-bound discipline, has thrust upon it the heavy demands of educating youth. Ours is not simply educating youth to live in a technological world, but to acquaint students with the nature of technology, its methods, its products, its workers, its problems, and most of all its value systems. This will prepare youth to meet, head-on, the problems and challenges posed by our dynamic technology, not to grope unrealistically into the current era, but rather to have the ability to use human reason, imagination, and ingenuity to cope with tomorrow.

During the last few years there has been increasing interest in technology for the non-technology student, resulting in a wide variety of courses being offered. These courses cover the entire spectrum from the applied sciences to that which may be best described as social science. The bulk of the courses appear to be somewhere along this continuum, but generally closer to the social sciences. The central thrust is pointed at the implications and effects of technology on society. Yet all have been inspired by a common goal—precisely, that an individual is no longer truly educated for the current era if he is technologically illiterate. The promise and problems that technology holds for the future can be pursued, met, and solved only by an educated populace.

As we in industrial arts strive to develop an educated populace, or should we say, a technically literate populace, we must capitalize upon the current surge of awareness and quest for answers to the perplexing era in which we live. There are emerging new methods of problem solving, new insights, increased emphasis on responsibility, accountability, and planning for the future. Entering into this area of general education for all, Technology for the Non-Technologist may well be the greatest opportunity ever proposed to industrial arts education.

St. Cloud State College entered the area of MAN-SOCIETY-TECHNOLOGY in 1962. Prior to that time, efforts had been made to develop a course along these lines and offer it as a humanities appreciation course—to no avail. However, in 1962, a faculty member was given released time to design a course which would provide general education based upon technology (industry) for all students.

The first step was to determine objectives. In considering the potential students, it was quickly assessed that the majority would have had little or no contact with industry. Therefore, the only logical approach would be an overview of industry as a whole with the single primary objective to develop an awareness of technology and its impact on society. At the same time came possibly the most controversial concept concerning the course, that it should be strictly a lecture-discussion course which would have no laboratory experience.[1] It was felt that the students are interested in learning about the history, development, organization, causal-effects, and future aspects of technology. The next step was to organize the content of the course, select a text, and come up with a title.

The basic content was difficult, since few in industrial arts had ventured into this area. As the content began to evolve, it rotated around the following basic areas: 1) Chronology of Technology, 2) World of Work, 3) Mass Production and Automation, 4) Technology and Education, 5) The Labor Force, 6) Technology of Selected Countries, 7) The Future, and 8) Current Issues and Research.

With these basic subdivisions in mind, we began the search for a text. After reviewing many texts, a compromise was made because no single text could be found which was felt to be entirely satisfactory. The text selected was a McGraw-Hill publication—Modern Technology and Civilization by Charles Walker. After selecting the text, there was unanimous agreement within the department that the course title would be the same as the text.

The most difficult step, as most are aware, is "selling" the concept to the curriculum council. After considerable debate, it was agreed to place the course in the general education offering of the college as an adjunct, with the understanding that it should be elected only when the "regular" courses could not be taken.

The pilot offering was scheduled for the spring quarter of 1964. When the spring quarter schedule came out, the course was listed as "Orientation to Industry." The result was a disaster; only a few students registered, and the course was scratched. Every avenue was pursued to determine how or why the title change came about. It could not be determined. However, the course was rescheduled for the fall quarter of 1964 under the correct title, and seven students registered. It was a beginning.

The following year, 1965, the course was placed into the general education listing as one of a block of four where the students select three. This block contains history, geography, psychology and our course. We, therefore, have the possibility of enrolling 75% of the freshman class.

We have grown from one section of seven students to 40 sections/year with 50 to 75 students/section. We will reach about 2250 students this year. There is no question in our minds that we could fill more sections if we had faculty to teach additional sections. Our experience has been that virtually every section offered has filled up, with students petitioning to enter closed sections.

The content of the course has evolved to the following:

I. Introduction
II. Chronology of Technology
III. World of Work
    A. Industrial Organizations
    B. Labor Unions
    C. Labor Management and Government
    D. Employment
IV. American Industries
    A. Raw Materials
    B. Manufacturing
    C. Construction
    D. Transportation
    E. Communications
    F. Service
    G. Energy Systems
V. Education and Its Relationship to Technical Advancement
    A. Purpose
    B. Types, Functions, and Industrial Education

VI. Industrial Revolution
   A. Mass Production and Automation
   B. Free Time—By-product of Technology
   C. Environmental Effects of Technology
VII. Population—Food: A Technological Phenomenon
VIII. Technology of Selected Countries of the World
IX. Future Aspects of Technology
X. Current Issues and Events

The text presently being used is: Fabun, Don, The Dynamics of Change published by Prentice-Hall.

As the course progressed, the primary objective—An Awareness of Technology: Its Impact Upon Society—is still foremost. However, a series of behavioral objectives was developed. These are summarized as follows:

(1) Prepare an analysis of the concept "technology."
(2) Describe the American labor force and labor movements.
(3) Follow an industrial organization chart.
(4) Differentiate between mass production and automation.
(5) Compare the technological status of the U.S. with that of other countries.
(6) Define industrial education.
(7) Prepare a research paper on a technological topic.
(8) Define the concept of free time.
(9) Prepare an analysis of a current issue.
(10) Analyze a major American industry.
(11) Discuss employment and its various sub-divisions.
(12) Identify the reasons for increasing population, food crisis, pollution, and related issues.
(13) Recognize the impact of the computer on technology and society.
(14) Other objectives as specified by the instructor.

With many faculty instructing the course, it was agreed that there would be a common syllabus and text. The approach to the course content would be the decision of the individual, because it was felt that this method would allow the course to be designed and presented in the manner most interesting and comfortable for the instructor.

There is an interesting sidelight at this point. Almost without exception, all faculty who have been assigned a section of the course have been extremely apprehensive about teaching the course. This feeling is rooted, as we see it, in two areas: 1) Possibly never having taught a complete lecture-discussion course, and 2) a feeling of inadequacy because of the lack of exposure to the wide variety of topics. However, almost without exception, the instructors, after teaching the course, are excited about teaching it again. The instructors felt that it had added a totally new dimension to their teaching and understanding of our field. We are the first to admit that the first time through is an extremely difficult experience, because it generally requires extensive organization, reading, and more importantly, a new approach to teaching.

There appear to be two new areas of opportunity for industrial education to embark upon for furthering the concept of general education. These areas are technology assessment and futuristics.

Technology assessment is a new, exciting, and challenging concept. Recently the White House Office of Science and Technology commissioned a $100,000 study aimed at the development of a framework that might be useful to organizations assessing technology. Economist Martin V. Jones of the Mitre Corporation, McLean, Virginia, coordinated the research.

The purpose can be best illustrated by citing the "Commercial Technology Assessment Act of 1971" which states:

> (1) to consider the long-range effects and extent of the influence of existing and new commercial technology on our nation's economic and social goals and on its environmental quality;
>
> (2) to develop, encourage, and maintain a capability to undertake independent research and timely analysis so as to provide early warning to all branches of government and to the general public of environmental hazards and economic and social costs; and
>
> (3) to undertake appropriate technological assessments prior to enactment of new legislation or funding of new programs where resulting technology might impinge on our national social

and economic quality, and to identify alternatives to such technological developments or new legislation or regulation of technology.

St. Cloud State College will offer in the fall of 1972 a four-credit course at the upper division level. This course will be strictly an elective course for all majors on the campus.

During the year 1972-73, a course will be drawn up for Futuristics. This will also be for four credits at the upper division level and will be a general elective. No formal material has been prepared at this time.

Ever since man could fathom the concept "future," he has tried to predict what lay in store for him. This drive to view our world may well be the drive that provides the foundation of our present science and technology. If we accept the thesis that technology is the force causing the change and adaptability required today, then it only seems logical that its influence will continue into the future. Therefore, it seems reasonable that industrial arts should also enter into this area.

Will you then teach the non-technologist that it is the technologist who will assist and be the discoverer, innovator, and creator who will shape the future?

Toffler, who wrote Future Shock, has raised the issue which ultimately may be the answer—"Yet for all this rhetoric . . . our schools face backwards toward a dying system, rather than forward to the emerging new society."[2] He goes on to place the charge directly in our laps. "The technology of tomorrow requires not millions of lightly-lettered men, ready to work in unison at endlessly repetitious jobs, it requires not men who take orders in unblinking fashion . . . but men who can make critical judgments, who can weave their way through novel environments, who are quick to spot new relationships in the rapidly-changing reality."[3]

FOOTNOTES

(1) The author feels strongly that this approach to the course has been one of the key reasons for its success. There are many who argue, quite vehemently, that in order to teach industry, the student must have first-hand contact with the materials, processes, and skills of industry. That appears to be a moot point.

(2) Toffler, Alvin, Future Shock, Random House, 1970, p. 354.

(3) Ibid., p. 357.

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Technology Assessment

Lee H. Smalley

There should be no need to emphasize the importance of understanding possible changes brought about because of technical change. Most of our history is a chronicle of the adjustments made by nations, institutions, and individuals to new technologies. The rate of change has increased so that we do not have generations of time available to adjust to new dimensions. We know that it is really not necessary for society and its members to be buffeted hither and yon by new technologies as a rowboat in an ocean, but that we can and must develop the methods for analysis and direction of technological change. The future of technology holds great promise for mankind if greater thought and effort are devoted to its development. Through technology assessment, means are being sought to predict, evaluate, and direct the path of technological change.

SCOPE AND DIMENSIONS OF A COURSE

One of the courses I teach at the University of Wisconsin-Stout is entitled, "Basis of Studying the Impacts of Industry and Technology." This is an elective course for Masters degree students and required for those working toward the Educational Specialist degree. Generally, the assignments in the course are related to an invention, describing impacts, contemporary technology problems, structures of an industry, history of technology, and a technology assessment. This paper will deal only with this later assignment.

There are numerous proposed outlines or steps of procedure for completing an assessment. From several of the proposals, I have put together the following sequence of questions to answer:

I. Name and briefly describe the technological change that is to be assessed.
II. Specify the social and technical objective to be achieved by this technological application.
III. Contextual factors:
   A. Demands of participants
   B. Resources available
   C. Customary practices
   D. Influential trends
IV. Consideration of alternative proposals designed to achieve the same or similar social objectives
V. Projection of the probable outcomes of each alternative proposal
VI. Cost/benefit assessment of the technological change
VII. Conclusions — recommendations

Students in class have explored a variety of topics. A sample of these include: "Cable Television," "Numerical Control Machines," "Pollution-Free Car," "Electrical Discharge Machining," "Manufactured Housing," "Artificial Insemination," and "Contraceptive Pills."

This is apparently on its way to becoming a cross-disciplinary, problem-oriented, and generalist type of expertise. References are everywhere, from novels to popular literature, technical industrial reports, philosophic essays, and governmental reports. Students need to range far beyond normal "cited literature" to get the background for even a minimal assessment of a technology.

These assessments should be concerned with evaluating the full range of techniques that are relevant to a particular decision or change. Social and political institutions should not be excluded. The two most important aspects of technology assessment are the evaluation of alternative means to the same end and a comparison of their social and economic costs.

TECHNOLOGY ASSESSMENT

Raymond Bauer, in his book, Second-Order Consequences: A Methodological Essay on the Impact of Technology, uses this analogy:

> How does one carry out technology assessment? I suppose that at this stage the problem is akin to that of how one can eat an elephant. The only answer is that one must begin by biting the elephant. And, considering the magnitude of the task, it is difficult to argue that one place is better than another for biting to start. And, after a considerable amount of biting has taken place, the elephant remains largely unscathed.

Although attention appears to be focused now on the negative effects of technology, an effective system of assessing technology would as often stimulate the development and application of desirable new technologies as it would give warning of possible harmful side effects.

Following are some examples of technology assessment studies that have been done by private research groups, government bodies, or industry teams: mariculture or sea farming; computer-communication network; technology of teaching aids; subsonic aircraft noise; multiphasic health screening; routing of interstate highways; allocating the electromagnetic spectrum; chemical pesticides; weather modification; manned interstellar exploration; urban development modeling; and drug efficacy study.

There is a need for broad involvement in the assessment process. The federal government has moved in this area: some grants to "think tanks"; numerous bills to establish a technology assessment branch to advise the Congress; some laws to mandate assessment studies prior to a decision that would involve environmental considerations. Private industry is also seeing more clearly that concerns for other than the balance sheet will have to be taken into account before a process or product reaches the final stages. Assessment studies should try to maintain the greatest practicable latitude for future action.

There are two other groups that need to become involved. One is on the citizen level through special interest groups, and the other is in formal education. If education is to relate to the trends, mores, attitudes, and problems in the society within which they reside, this will have to be included in the curriculum. There are many possibilities for placement at different grade levels, within existing courses, or as a separate interdisciplinary offering. Obviously, more trial and errors will have to be attempted before any kind of scheme begins to emerge as a viable alternative. We do know, however, that industrial arts teachers can and should provide the leadership to explore the possibilities of technology assessment. Ask yourself, "What is more important in 1972?" Also remember, "The real aim of education is not knowledge, but action."

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AIASA

American Industrial Arts Student Association

How To Develop and Organize an Industrial Arts Exhibit and Competition

Steven A. Walker

Why should there be an industrial arts exhibit? This is a question which should be answered before we can plan such an exhibition. If we can agree that a student needs to display his knowledge and skills on a competitive basis with his peers, the public needs a better understanding of the industrial arts program, and educators and the public need a cooperative endeavor, then what better event would fill these needs than a planned exhibition? If it is to be successful, the exhibit, whether local, regional, or state, requires the cooperation of many individuals. In their efforts to produce a fair, educators, students, and industrial and business personnel establish a working relationship that is beneficial to all.

The young people who participate in these fairs exhibit a visual indication of their positive attitude toward work. The student is involved with his peers in a contest. Whether it is judged or not, his ideas, originality and skills are challenged. Here he can learn the value of his work and can draw his own conclusions. The student who is really motivated begins to plan for next year. He notices new materials and processes and questions himself, other students, and teachers. He has formed new ideas!

How does a student gain from the exhibition? He develops a wholesome attitude toward the dignity of work as well as evaluating himself in relation to his peers. He will have the self-assurance and respect that competition affords. He will have the satisfaction that he represented his school and community in a contest. The student will have experienced recognition for his participation in the program.

How does a teacher gain from the fair? The teacher will meet old and new friends, all seeking to promote the industrial arts program. With the information exchanged, he should become a more versatile teacher. Whether his students win or not, he will evaluate himself and his teaching program. This should cause him to be more aware of up-grading his programs to guide future citizens of our society.

PRELIMINARY PLANNING

The exhibit should be designed to meet the geographical needs and objectives of the industrial arts programs. These needs and objectives will differ in each level of fair (local, regional, or state). The instructor must decide at what level his program will participate. When that decision is made, the teacher can plan a fair to meet those needs and objectives. Some of these needs or objectives may overlap into two or more of the fair levels.

The local fair may consist of a project display with no official judging or competition. Some of the objectives for a local fair are to develop in the student an increased appreciation for his work, strengthen the motivation of the student from public response, develop a better public understanding of industrial arts, and to develop a cooperative relationship with industry and business. At this level, the problems are minor and can usually be solved easily. Since many teachers use the local and regional fairs as preparation for the state fair, their projects must be finished by the middle of April. Some teachers enter the regional fair first and establish rules that only their top three winners in each division are eligible to enter the state fair. After the state exhibit, they then hold their local fair, displaying the projects with ribbons or trophies won at both regional and state fairs. This type of display may be set up in the school, but meets greater success if put into the local business store windows.

The regional fair involves many schools in a geographical area. The objectives of this fair are to assist the student in developing a cooperative attitude with his peers, develop in the student a sense of community pride and responsibility, expose the student to a wider variety of projects and competition, and establish a cooperative relationship between instructors.

The regional fair has definite rules and generally contains project contests, student participation contests, and possibly a sweetheart contest. The rules may be derived from the State Fair Rules Handbook or compiled by teachers who will be participating in the exhibition. These rules should be so designed that there is little confusion as to what division or classification covers a project.

Since the regional fair covers a wider area, it has several unique problems for the instructor. One is the transportation of projects and students. Busses, trucks, or trailers must be acquired. Some large rental companies will loan their equipment free of charge. If the fair lasts for two days and there is some distance to travel, housing may have to be obtained.

Adequate space should be sought so that all sections of the exhibition are in one building. This helps to eliminate confusion and the wandering of students. Many large shipping malls have promotion managers who are seeking drawing cards. These people can assist by furnishing space, publicity, and security, generally all free of charge. If the fair is held in a shopping mall, many more people are drawn to the exhibit than if it is isolated in a gym or similar building. Since most malls stay open late Friday nights, projects could be entered at that time and very early Saturday morning. Judging can be done from 8 to 10 A.M., which is the standard time for most businesses to open. Leaving the projects on display until 8 P.M. will ensure a large public exposure.

If there is to be a sweetheart contest and a talent section is included in this contest, there should be correspondence before the fair so that any equipment needed can be arranged for in advance.

There must be a method for checking in and out all projects to insure that none are lost or stolen. A registration card that can be separated into four parts, each part with identical information and numbers on it, works very well. One card is kept by fair officials, one is given to the teacher, and two are taped onto the project face down so that only a classification number shows. At least one card always stays with the project. If the project wins an award, the third card is taken, the award attached to it, and it is used by the fair officials in tabulating scores on a winners sheet. When the teacher checks out of the fair, he is given an envelope containing the third card with awards. In this way, ribbon snatching is discouraged. Before the project can be removed from the building, the card and number given the teacher must match the card and number on the project. The teacher must be present at check-out time. Small items such as rings or knives should be kept in display cases. These display cases may be furnished by the regional association or the individual school.

The State Fair planning should start at least eight months before the exhibition date. This is the fair that involves the widest variety of people and events. College instructors, teachers, college students, industrial and business personnel, and commercial people all contribute to the fair. Objectives of the state fair are to develop in the student a respect for his fellow competitors, give the student incentive to advance his abilities, further develop the cooperative attitudes of the student, give the student a chance to excell at a statewide contest, assist the teacher in evaluating his program and students, and bring the industrial arts program to the attention of people in the state political and educational realms.

Since the state fair is larger, it requires more of everything. A fair of this size requires a vast amount of space, and space of this size and quality may be expensive. Unless a large college gym can be obtained, a municipal building will probably have to be rented. The finances for this will have to be raised, possibly from several sources; for example, the state Industrial Arts Teacher Association, commercial exhibits, and donations from industrial and business contacts. If you must obtain a municipal building, try to find one as centrally located in the state as possible. These buildings are booked well in advance, so it is wise to check early, select a date, and try to reserve the building for at least 5 years in advance. If there is to be a banquet at the fair, arrange for a caterer well in advance, for several years if possible. Check with all local motels and hotels that are convenient to the exhibition building, for those which will give discounts to schools. Send a list of these to all schools who might participate. This list should be sent well in advance of the fair date to insure room reservations.

Most municipal buildings are under union contracts, and much of their equipment must be union handled. Here is an area where a good liaison man can save the fair money. In the talent and sweetheart contest, where stage lights, microphones, and musical instruments are needed, a union crew will operate the control panel and equipment. To save time and money, all talent and sweetheart contestants should have a deadline date to submit the length of their program and equipment needed.

Tours can be arranged so that the students and their teachers may visit at least two industries. These tours should be arranged in advance, and the groups should be limited to no more than 20 students each. For students from small towns, this is an opportunity to see mass production and manufacturing first hand.

To reduce registration and project entry time, pre-registration cards can be sent to teachers who wish to participate. If a teacher has entered a student who didn't complete his project, it would be a small matter to pull his card; to fill out a mass of cards close to deadline time invites confusion. The classification and registration cards used at the state fair are similar to those at the regional fair.

If commercial booths are sold to help defray the building cost, send the applications out early. The commercial booths should be in the same room as the project displays. When off in an area set aside for them, they don't get the traffic desired. In the same light, many colleges have industrial arts booths and would like a chance to display their programs. Generally, the college students who man these booths will help with the fair in some capacity.

For all the events which require judges, the selection and commitments of the judges should be made well in advance of the fair. In the project contests, a judging team composed of a college instructor, high school teacher, junior high school teacher, graduate college student, and a professional from business or industry does an impartial job with few dissatisfactions from teachers or students. The business or industrial people who have participated have asked to do so again "next year." Undergraduate students from colleges in the surrounding area can perform many jobs and gain considerable experience with projects, students, and teachers in a short time. These young men hopefully will return one day with their students' projects.

In all the exhibitions, the publicity media should be informed and present. A local follow-up in the news media for each fair will provide the students with a feeling of accomplishment and community recognition. In addition, the industrial arts program will continue in the public eye.

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Space, NASA, and You

Eugene E. Horton, Jr.

On Wednesday, January 5, 1972, Jenk Jones, the managing editor of the Tulsa Tribune, passed along to his Oklahoma readers the following gloomy forecast for the nation's space program. Let me quote.

> This December, the last footprint of America's Apollo astronauts is due to be left in the timeless dust of the moon's surface.
>
> What then? Is America to turn its back on this fourth dimension of manned travel, the space voyages out beyond the latitude and longitude and altitude of our life-sustaining atmosphere?
>
> At present, the manned space flight program looks like this:
>
> --Apollo 16 and 17 flights in April and December apparently will conclude the program that for the first time put the feet of man on a celestial body other than the earth.
>
> --Apollos 18 through 20 have been scratched, and there appears slim chance that they will be reinstated.
>
> --The Skylab flights in earth orbit are scheduled for 1973, with durations of up to 28 and 56 days. A host of scientific experiments are planned for these flights.
>
> --The United States and Russia are looking toward a joint space venture, the primary gain from which might be increased scientific cooperation between the superpowers. A mid-1970's date appears likely.
>
> --The space shuttle, hopefully scheduled for first launches in 1978, could be the transportation breakthrough that would make space stations feasible homes for scientific communities. Yet final designs are still undetermined, and there is no assurance that Congress will come up with the necessary funds.

--Very minor work is being done toward a manned mission to Mars and the establishment of a lunar base. Both appear inevitable, but far in the future.

Thus, beyond the Apollo windup and short-life Skylab program, this country has a void in its space comn nt.

The nation at took the greatest steps in mankind's history may drop out of the manned space picture c time when once-nebulous benefits seem ripe for the plucking.

In his recc. tate of the Union message, the President of the United States had this to say about the commitments and directions this nation should take to advance science and technology in the seventies:

> As we work to build a more productive, more competitive, more prosperous America, we will do well to remember the keys to our progress in the past. There have been many, including the competitive nature of our free enterprise system, the energy of our working men and women, and the abundant gifts of nature. One other quality which has always been a key to progress is our special bent for technology—our singular ability to harness the discoveries of science in the service of man. ...the space shuttle is a wise national investment. (I urge the Congress to approve this plan so that we can realize these substantial economies and these substantial benefits.) This vehicle (the space shuttle) is one that can be recovered and used again and again, lowering significantly both the cost and the risk of space operations. The space shuttle would also open up new opportunities in fields such as weather forecasting, domestic and international communications, the monitoring of natural resources, and air traffic safety.... Science and technology represent an enormous power in our life—and a unique opportunity. It is now for us to decide whether we will waste these magnificent energies or whether we will use them to create a better world for ourselves and our children.

The remarks of our chief executive reminded me of an editorial I read in the Christian Science Monitor during the days immediately following the epochal flight of John Glenn three times around the earth in a Mercury spacecraft. It said, "Civilization advances by the great forward thrusts of pioneers. Then comes the slack periods, when society slowly, often all too slowly, catches up."

The events since that great moment in American history seem to have confirmed this. The attention of the public since our first lunar landings has turned to more terrestrial problems: the problems of our inner cities; drug abuse; population growth; developing safe, fast, pollution-free transportation; creating new sources of clean and abundant energy; providing better health care for our citizens both in their productive years and in later life.

Clearly, our civilization has experienced one of the greatest forward thrusts in its history with flights beyond the atmosphere and to the surface of the moon. These accomplishments have provided man not only with a wealth of new materials and new skills acquired in building the necessary hardware to support these missions; it has additionally provided him with a new perspective on his planet and its life, a perspective which may be viewed by historians as the single most important contribution of the entire space program. This view of ourselves is described by poet Archibald MacLeish as "riders on a spacecraft together, brothers who now know that we are truly brothers." It may herald a turning point away from a course leading to man's self-destruction, to an enlightenment bringing the promise of new harmony and understanding throughout the world.

This view does not, however, erase the really gnawing questions in the minds of intelligent observers today who see what is going on in the changing world about them. The question is not, "Will science and technology continue to develop?" but rather, "How will science and technology develop? In whose hands, and for what purposes?"

Lawrence Lessing, in the March issue of Fortune, puts it this way: "The immense prestige of U.S. science is being undermined by assaults from several different directions. If this wildly irrational campaign does not end soon, the U.S. can become a second-rate power and a third-rate place to live." Dr. Philip Hanler, President of the National Academy of Science, says, "If we foreswear more science and technology, there can be no cleaning up of our cities, no progress in mass transportation, no salvage of our once-beautiful landscape, and no control of over-population. Those who scoff at technological solutions to those problems have no alternative solutions."

The environment today is distinctly unfavorable for science and technology. Some indicators are:

1. Weakening of our technical colleges and universities.

2. Serious setbacks in our aerospace industry.
3. Loss of student interest in science and engineering.
4. Tens of thousands of unemployed scientists and engineers.
5. Technological timidity on the part of an increasing number of our leaders.
6. Increasing attacks on areas of technical activity which are in good shape—but soon won't be!

This country must, of course, bite the bullet and decide what it wants to be. I am tired of hearing why a great nation—the greatest nation on earth—a nation whose will and determination and know-how could place human footprints in the lunar dust, cannot now solve the down-to-earth problems that urgently need solving. I think it is time we pulled ourselves together and solved them. Today we have the highest standard of living, the most advanced technology, and the greatest capacity to do good works of any nation on earth, and most Americans would like to keep it that way. It will require the best of our science and technology, not only to move back the horizons of space, but to find effective and permanent cures for societal and environmental ills; ills that not only plague us, but threaten our very survival as a species.

Whether all of us like it or not, we are a technological nation. Our entire business and commerce structure is built and will remain on a base of technology. With our high pay scales, advanced technology is all that allows us to compete favorably with the lower-priced labor markets of the world. Even so, as we all know, we have lost major portions of the manufacturing market to foreign competition in recent years. Last year, five nations—Japan, Italy, Canada, West Germany, and France—increased their exports of manufactured goods far more than we. Four of them lead us in spending on plants and equipment. Deeper and deeper inroads are being made into technological product lines in which we once felt secure.

In July of 1969, Americans rejoiced and the entire world marveled at the successful flight of Apollo 11 and the calm, self-assured voice of Neil Armstrong as he reported taking "one small step for a man, one giant step for mankind." It was far more than one man's step on a foreign planet. It was a reaffirmation of the courage and leadership and pioneering spirit of the American people. It was a time for unfurling American flags, not only on the moon, but across the length and breadth of our great land; flags that proclaimed proudly that "made in the United States" was still a phrase that should stand for quality and excellence and leadership throughout the world. Thus, 1969 was a good year for technology, for America, and for man.

Since 1969, the following changes have taken place. Our federal budget has increased from \$191 billion to \$246 billion. While this increase of \$55 billion was taking place, our defense budget dropped from \$81.2 billion to \$78.3 billion, and our space budget from \$4.2 billion to \$3.2 billion. The so-called civic sector programs and services consumed over half the budget, with substantial increases in social security and welfare, health, transportation, environment and natural resources, housing, and education.

So the government has indeed responded to civil needs. Yet in so doing, the danger exists of killing the goose that laid the golden egg. The two areas that have declined, defense and space, are those that have paced technological development of this country for the past 30 years. Last year, only about 7% of our tax dollar was spent on research and development. This is too low for a technological nation such as our own. The administration appears to be trying to build this up, but the competition for dollars is tough. Just like any successful business, the U.S. must plow back some of its gross national product into developing opportunities for us all. Contrary to some public views, private industry cannot do it all—and never could.

With foreign competition as tough as it is today, how then are we to maintain our pre-eminence in science and technology? The answer is relatively simple. We must continue to work on the most challenging and difficult scientific and technological problems of our day. There is no other way—none.

For the educator who must prepare tomorrow's leaders in the classrooms of today, there is a very special problem. In my view, he must comprehend the changes in man's life and the future of his home planet that have been brought into focus by the flights of our Apollo astronauts. He must communicate the true meaning of the term "Spaceship Earth" to his students in such a manner as to help them to understand the role of man, and the role of his science and technology, in protecting and preserving the earth's interdependent systems. He must cause the younger generation to become aware of what is required of all men to keep a healthy place for living things.

Preserving our home in space, and preserving it in as free and as peaceful a condition as possible, is and must continue to be the fundamental goal of this and following generations.

In this endeavor, it appears that the practical use of the near frontier of space—particularly of studies of the earth and its environment—is of critical importance.

In discussing "Space, NASA, and You," I have described missions in near earth orbit and to lunar distances which are currently planned. I have spoken of the critical need to advance science and technology on a broad front, using new knowledge in a responsible manner to address problems common to all men, problems that center on survival and the future of life on this planet. I have suggested the need to instill in our young citizens informed attitudes about science and technology, clarifying the true meaning of the man's recent accomplishments, such as the Apollo program, and the impact of these accomplishments on their future.

Today, scientific and environmental literacy is a must for all citizens, for in a democratic society it is our citizens who chart the nation's future directions. They do so in the decisions they make at our voting places, decisions which more and more are centered on the workings of science and technology.

Not only in science, but in all areas of education, we must try to instill in the future citizen, in the future electorate, and in the future leadership of this country, a sense that these actions in the present should be biased by an enlightened self-interest in the future, the future of the nation, and the future of mankind.

NASA, may I suggest, is by its very charter the agency of the future. It is the agency charged with the mission of pushing back the horizons of man's knowledge of himself and his relationship to the world about him; it is knowledge, not rockets, nor spacecraft, nor astronauts, that is NASA's principal product.

Now, finally, let's look at where these efforts to push back the horizons of man's knowledge are taking us.

One day, out of the activities of NASA, may come air and water as pure as that found in the Antarctic region, a perpetual food supply to feed the starving millions on our crowded globe, an inexhaustibe source of energy to drive the powerplants of the world, a lifespan to rival that recounted in Genesis (perhaps even longer, as we move out to the more distant goals in the space), vehicles capable of reaching the stars and returning and perhaps unlocking the fundamental secrets of life, and computers that can be programmed to automate any mechanical process or device.

The basic problems of our times, however, cannot be programmed on a computer. We all know that there is a dangerous urgency to such questions as the following:

How can the individual obtain personal justice in an impersonal world?
Who can say what, and where?
Who may have children, and how many?
Who may live on this planet, and where may they live?
Who may put what substances into the rivers and oceans of the world?
Who may put what foreign substances into the world's atmosphere?
Who may put what messages and images on the airwaves of the world?
Who may propel what objects into space and the reaches of the universe?

Finally, we must continue to grapple, now on a cosmic scale, with the oldest problem since man ceased to be a mere food gatherer and went on the offensive to possess first, the earth and now the universe. Namely, who may bear arms, and what kinds?

Many of these questions must be answered by knowledge yet to be gleaned, and these and many other perplexing questions have a direct relationship to and give a new dimension to all education in our times. This inevitably leads to the final question in the equation for survival I have presented involving Space, NASA, and You. It is simply this:

Will the democratization of all learning, especially the technological learning so essential to enterprises such as NASA, bring a new era of freedom tempered by justice and compassion, or will it only hurl mankind more swiftly toward some final holocaust?

NASA has, I believe, both a unique opportunity and a trememdous responsibility in easing man's struggle and enhancing his chances for survival on our crowded planet. It is a two-fold responsibility to extend man's knowledge of his home planet and also to bring this knowledge into the mainstream of American education more rapidly than would be possible through traditional methods of information transfer. It is a difficult job, requiring the support of many. Yet, if the job is not done, there will be a dramatic gap in knowledge and action, the "slack periods" referred to in my opening remarks will stretch longer, and schools and governments will be unable to fulfill their functions in our time.

Mr. Harton, NASA Manned Spacecraft Center, Houston, Texas, is currently serving as Education Officer; one of the early members of the Space Task Group, management element for this nation's first manned space flight, Project Mercury.

So You Want to be an Industrial Education Teacher

Robert B. Sonderman

Regardless of our increased scientific and technical advances, human beings have never been able to solve the seemingly simple task of communication. A major concern in communication is "semantics" which, as you know, is a study of meaning and changes of meaning. In scientific and technical terms, semantics is a branch of linguistics concerned with the nature, structure, and especially forms, of speech or symbols.

As we reflect upon the title of this presentation, we are confronted with the term "Industrial Education." Had I selected the topic, I would have been more comfortable with the term, "Industrial Subjects."

There are probably as many definitions of industrial education as there are AIAA members in Dallas. My conception of industrial education is that it is a generic term which embraces industrial arts, occupational (vocational or career) education or trade and industrial courses, and industrial technology. The initial two are teacher education programs, while the latter is non-teaching oriented. We can further refine these to levels such as pre-school, primary, middle school, junior high, high school, and post-high school. Each level possesses a specific philosophy and selected objectives—behavioral or otherwise.

In 1972, the major thrust at all levels is regard for career or occupational information geared specifically to K-12. To my knowledge, there is no scientific evidence that it is inappropriate to gently jog pre-schoolers into orientation to careers.

Almost 20 years ago, a researcher set out to ascertain the "readiness" of pre-school children and 4- or 5-year-old kindergarten children of both sexes for selected constructional and assembly activities. The researcher was pleasantly surprised to discover this age group to be quite apt. As a segment of the research, approximately 50 toy manufacturers were contacted to learn what means are utilized to categorize the age level at which a child could succeed with a specific toy. Only one of 50 reported any form of effort to determine grade or age placement. It was concluded that these manufacturers sell toys to adults and not children and scale to a success factor for a large population.

We should consider industrial education for pre-school and primary as broad and basic, with increased specialization as the individual advances through the educational maze. In middle grades and junior high school, the phrase "exploratory experiences" creeps in. In high school there is increased specialization, and by grade 14, industrial education is characterized by narrowness and technical depth.

Threaded through all levels is a general education motivation, a recreational motivation, a career and occupational information motivation, and ultimately a pre-vocational or possibly a very technical narrow specialized motivation.

Now, a look at the word "teacher." This word means something entirely different to each of us. Some recall a kindly, gray-haired woman in a gray suit who was the first teacher. Some recall a loud, brash, male teacher who was more dictator than teacher—while the first teacher may have been especially permissive.

Let's take a peek at specific types of teachers. Some will be quite familiar and your very favorite may be a composite. These types are primarily suggested by James O. Proctor from his book TNT—Techniques, Notes, Tips for Teachers.

Remember the Showboat or Athletic Type?
How about the Intimidator?
How about the Slick-Smoothie?
How about the Golden Throat Orator?
How about the Seated One?
How about the Preoccupied—genius or guardian spirit?

Now, HOW ABOUT THE REAL TEACHER? Here we move to a task analysis technique and make an effort to identify or inventory exactly what a teacher does. In no particular order, a teacher should be a

friend	salesman	mediator	para medic
counselor	thinker	mechanic	discoverer of talent
defender	problem solver	trouble shooter	encouragement expert
judge	investigator	demonstrator	instigator
jury	inquisitor	adjustor	purveyor of information
lawyer	therapist	organizer	bringer of joy and success

DO YOU STILL WANT TO BE A TEACHER? If so, let's match some facts. First, facts about the profession and, second, facts about the prospective teacher. Do you have it?

Now, how to get started?

In 1972, the major thrust in many school communities is to provide occupational or career information from kindergarten through grade 14. Actually, in many situations, this orientation can be initiated with pre-school children. If a guidance person, a teacher, a parent, or an individual (the child/student) identifies an interest, aptitude, or potentiality which one might conclude is of sufficient magnitude that the client/pupil/student could succeed in it as a career—he should be so encouraged. It has long been accepted that a charge to teachers is to identify (discover) and then develop talents in students, particularly in the applied and technical sciences.

After the individual has been discovered or isolated, he or she should be encouraged to pursue an education in the primary grades, middle grades, and upwards channeled to his potentialities. This should be conditioned to a large measure by the demands made by senior-level institutions for quality preparation of the prospective enrollee.

Prior to graduation from senior high school, the potential teacher should seek to select an institution of higher learning and study the admission requirements. Many high schools provide college days for visitation, and countless students visit institutions independently. Then, hopefully, the school desires the student and the student desires the school.

Concomitant with the educational preparation should come occupational competency. It has been thought that the best industrial education teacher possesses a trade. This presenter is, for all practical purposes, a cabinet maker by trade but a teacher by profession. Although scientific studies are not conclusive, the evidence apparently does not specify that an industrial education teacher must be a tradesman, but it is encouraged.

The intentional cultivation of a capacity to take an active and constructive place in the social, religious, economical, and political life of a community is a culmination of intensive meaningful education. No single segment of society, institution, or agency can hope to accomplish this task alone and separate. It is simply a monumental task. The answer is a persistent collaboration of all forces, institutions, and agencies that are adequately concerned and oriented with the task of preparing each evolving generation to adjust to the inescapable problems of existence.

School personnel mirror the preparation in terms of making adjustments. The youth, upon reaching adulthood, discovers himself capable to participate actively and gracefully in the social life of his community, and he is said to be well-adjusted. So it goes with occupational adjustment. This is dependent upon the concept of an individual matching his aptitudes, abilities, and interests with the requirements and demands of the occupation. One person has said that, "A man's occupation is the watershed down which the rest of his life will flow."

If anyone of you is as happy and well-adjusted in his profession as this presenter thinks he is . . . in his . . . GOD SPEED.

Dr. Sonderman is Professor and Head of Industrial Arts Education, Eastern Illinois University.

So You Want to be an Industrial Education Teacher

Ted S. Jones

Ten years ago, I would have termed a prospective industrial education teacher as slightly deranged. Five years ago, I would say you might have a chance if you can stick it out. Today, I feel I am addressing the group that will be in on the ground floor of the age of "professional," "respected" industrial education. You are the people who will see the turning point in our profession. You are the people who will for the first time go out of the "lamp-making" business and into true education concerning industry.

First, let me tell you about industrial education of the past. The first thing you must realize is that we were not considered educators, and we certainly had no contact or relation with industry. We were the "shop teacher." To me, the greatest single setback our group suffered was the massive attempt at retraining returning veterans at the end of World War II. We were forever tarred with the title of vocational or manual training teachers. The huge demand for this training was due to the millions of men who had no civilian trade and the advent of the G.I. bill. These former servicemen enrolled in technical schools of all kinds. Some were seriously interested in learning a trade. Some were only attending for the G.I. money and to avoid going into a trade. Many went on to college, of course, and many completed their technical training to become productive and useful citizens.

But imagine the administrator of a "vocational high school," or a technical trade school, when this flood of humanity hit his front door clutching perfectly valid checks from the United States government saying "train me—train me." This poor administrator had suffered through the war with a shortage of male teachers, no material to work with, and students who were only biding their time until the army claimed them. He didn't have time to wait for the colleges to turn out industrial education teachers. He couldn't find many IE teachers already trained. So he did the only thing he could do to salvage as many of those government dollars and as much surplus equipment as possible. Have 50 guys who want to learn to weld? Fine. Hire one welder to teach them. It didn't matter that the welder hired didn't know how to teach, only that he knew how to weld. Name the trade, and I can show you schools of this sort still being run.

Industrial arts, industrial education, industrial technology—you name it, and the public pictures a fat, old, uneducated tradesman teaching a two-year technical course, which has absolutely nothing to do with a college education. If you happened to be a college-educated "shop teacher," you were relegated to the ranks of this majority and ceased being an intellectual.

This curse that was visited upon us was also the beginning of the profession you are interested in now, and for this we can bless it. All across the country, professional educators were recoiling from the heresy of calling someone a teacher who didn't know how to teach. Groups of these men began seeking new, better, and professional methods of not only teaching these trades, but of teaching people to teach. This evolution did not occur instantly, or quickly, or in some cases even yet. There was opposition from every place. Our fellow educators did not consider "shop courses" as being valid academic subjects. The trade schools felt threatened by the competition. The old non-qualified instructors could see their jobs evaporating. Administrations balked at the quantity of equipment required. Even the students objected, because all they wanted was a snap course where all they did was make a lamp. Needless to say, most of these obstacles were partially overcome by these dedicated pioneers, and we are on the threshold of achieving the proper place of industrial education.

You will be teaching four classes of students. Number one: those students who will be going directly to industry after high school. Two: those who will be going to college to learn to teach IE. Three: those who will be going to college to study other disciplines but who need our courses for background, such as engineers. You will notice a glaring omission of the high school student who might go to one of the existing trade schools. I left this category out deliberately, as the percentage is so small it is quite insignificant. Also, if your profession does its job under the new plan, the trade school will be used only for retraining of employees whose job has become obsolete because of modernization.

So where does this bright new world fit in, and how should you contribute? The way I envision IE is an all-encompassing exposure to every part of industry, every trade, profession, and possible means of earning a living. Your state school boards and your local school boards will dictate the actual curriculum, of course, but I hope we are going to start IE as an academic, exploratory series of courses in junior high. Basic economics should be taught first. How does a business run? Branch out from these basics to expose the student to all forms of work-a-day occupations. All of this exposure is designed to one purpose: to help the student decide where and what he wants to do in life. Maybe he will find he does not want to work inside at a desk. This rules out many disciplines in which the student would be unhappy and probably unsatisfactory.

This curriculum will be predecided for you by the time you complete your training to qualify as a teacher. There is one aspect that is up to you, however. It's up to you to sell industrial arts to not only your fellow educators but to the general public. What I'm going to suggest will not be in this curriculum. On the high school level, have all the local trades-people you can get come in and speak to your classes. Get a plumber, an electrician, a CPA, an auto mechanic, and representatives of local industry. Let them explain to your students what kind of life they lead. Not only will these people be happy to do this, but they will be flattered to be asked to speak. While they are there, give them a selling job on what we are trying to do. If you sell the community, you will have sold your school board. If you cannot make industrial arts one of the most well-known and respected parts of your public schools, it's your own fault. "If the student hasn't learned, the teacher hasn't taught."

Mr. Jones is Director of Industrial Relations for Mosher Steel Company of Texas and Louisiana.

IACC

Industrial Arts College Clubs

American Industry: A New Direction

Harry B. Olstad

Today we live in a society that is highly industrialized, a society in which everything we do is in some way related to industry. If the children of our society are to someday function in an industrial setting and understand this industrial culture, it would seem reasonable to make the study of industry a part of our school curriculums.

In 1968, the American Vocational Association published A Guide to Improving Instruction in Industrial Arts in which the statement is made that content for industrial arts should be derived from that body of knowledge known as the social institution of industry. In enlarging on this thought, other statements are made such as "categorize understandings rather than categorize isolated facts," "that body of identifiable knowledge related to the total institution of industry," "to study all facets of industry and to explore their interrelationships," "experience the unity or wholeness of contemporary industry," and "develop an understanding of this aspect of our society with all its implications."

In the curriculum guide being developed for industrial education in Wisconsin is a definition which states, "Industrial education is that segment of education which draws its body of knowledge from industry and provides for the development of understandings and competencies relating to industry."

The idea of studying industry as a part of industrial education is neither new in terms of the times, nor is it unique to the American Industry program. What is important is that the steel industry or the building industry or the printing industry is not the basis of industrial arts, but the social institution representing the totality of industry now provides the body of knowledge for industrial arts—or in our case, American Industry.

DEFINITION OF AMERICAN INDUSTRY

The question often arises, "How can you take all of industry with its bigness and its complexities and put it into a teachable and meaningful course?"

First, it is necessary to set up limits to our body of knowledge, or put "handles" on it, so that we have something specific with which to work. We define industry as, "an institution in our society which, intending to make a monetary profit, applies knowledge and utilizes natural and human resources to produce goods or services to meet the needs of man."

STRUCTURE OF INDUSTRY

Having defined our body of knowledge, it is now possible to look at it for the purpose of organizing it into useable content. Most people would agree that it is impossible to teach all the facts and figures that are a part of industry. However, are there some basic understandings which can be identified as a part of all industries? These are the understandings or knowledge which American Industry identifies as being necessary to an understanding of industry (Figure 1). We call them concepts. The 13 basic concepts are communication, transportation, finance, property, research, procurement, relationships, marketing, management, production, materials, processes, and energy. These are set in an environment of government, private property, resources, competition, and public interest, all of which, in our society, makes industry uniquely American.

CONTENT OF CONCEPTS

Each of the basic concepts of American Industry has been organized into teachable content. This organization of content is referred to as "concept models" (Figure 2). The concept model identifies the various elements or subconcepts which are part of the broad concept; for example, to understand production, it is also necessary to understand the subconcepts of production planning, types of production, production systems, fabrication, and control. In looking at the concept of procurement (Figure 3), an understanding of need, method of procurement, source, quality, quantity, scheduling, and price are essential understandings within the broad concept. In turn, each subconcept consists of various elements which are dependent on sub-elements.

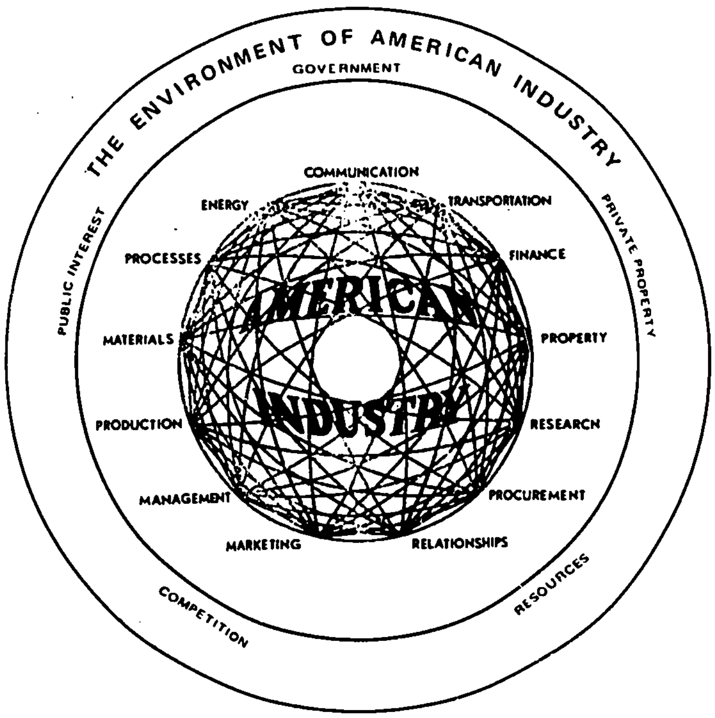

Figure I

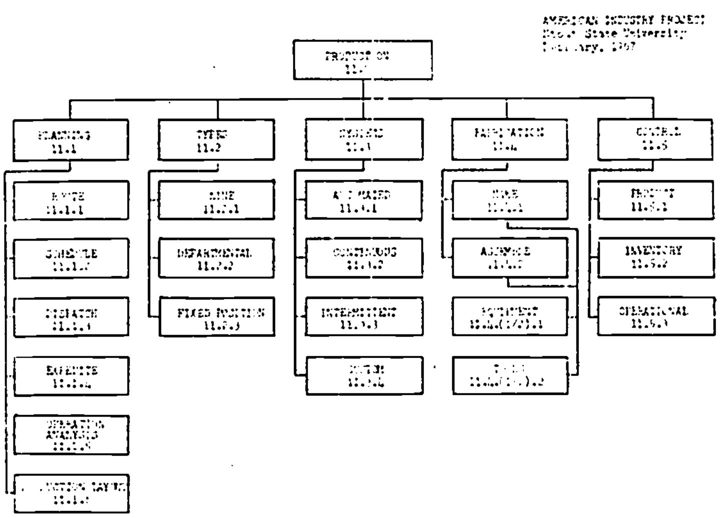

Figure 2

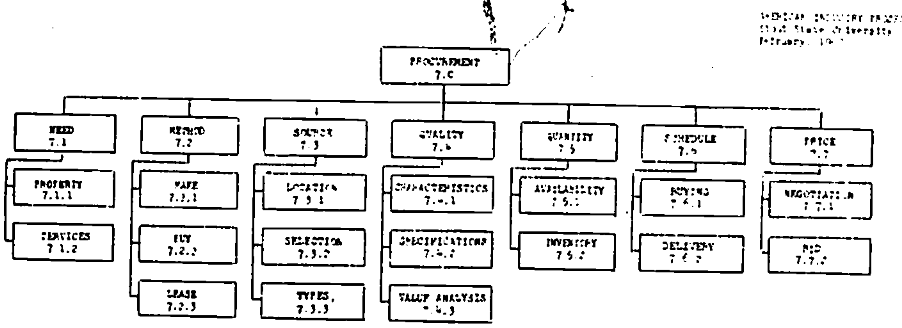

Figure 3

It becomes apparent that if we carry these sub-elements to their logical conclusion, we then identify the technologies usedby industry. In so doing, we might question whether traditional industrial arts has taught the technologies and then concluded that through the technologies might come an understanding of industry?

In American Industry, we begin with the broad understanding of industry and then ultimately progress from this understanding into the technologies which are used by industry. Briefly stated, we might say that we are developing an understanding of industry as a user of technology.

With the definition of industry, conceptual structure of the knowledges necessary to understand industry, and organization of content for each basic concept, we feel that the body of knowledge or teachable content has been identified. The big question becomes, "What do you do with it?"

OBJECTIVES

Some have asked, "Is a study of industry with its many broad implications appropriate for a program of industrial education—does it conform to the generally accepted goals of industrial arts?" In order to answer such a question, it is necessary to look at the generally accepted goals of industrial arts. In recent years, both the American Industrial Arts Association and the American Vocational Association have published statements of goals or objectives which are unique to industrial arts. The American Council of Industrial Arts Supervisors of A.I.A.A. first identified the following four unique objectives (1963): to develop an understanding of industry, to discover and develop student talents, to develop problem-solving abilities, and to develop skill in the safe use of tools and machines.

In 1968, the A.V.A. in A Guide to Improving Instruction in Industrial Arts again stated the same four unique objectives (with slight modification) and added one additional objective: to develop an understanding of industrial processes and the practical application of scientific principles.

In the State of Wisconsin, endorsement is given to the four original, unique objectives of industrial arts.

In accepting the five objectives or goals, there would probably be unanimous agreement that industrial arts has traditionally done an excellent job of developing skills, even though the philosophy of industrial arts has tended to down-play any emphasis on skills. The discovery and development of talents, interests, and aptitudes have generally been achieved through exposure to a few materials such as woods and metals or trades such as drafting and electricity. Problem solving has been limited to projects and technical activities rather than to industry. Activities and instruction leading to an understanding of industry have been practically non-existent or so limited in portraying the totality of industry as to be valueless.

American Industry provides a means of effectively meeting the objective of understanding industry and developing problem-solving abilities related to industry. If industrial arts is to be appropriate for general education, as has always been claimed, then it must be appropriate for all students. In that case, an emphasis on skills is wrongly placed for about 90% of the students. Therefore, a new direction which places emphasis on understanding industry and problem solving related to industry will bring industrial arts back into its appropriate place in the school curriculum.

The stated objectives of American Industry, then, are to develop an understanding of those concepts which directly apply to industry and to develop the ability to solve problems related to industry. These objectives conform to two of the stated objectives of industrial arts.

If industrial education is considered as a continuum extending from general education for all to the development of skills and competencies for careers in industry, American Industry makes an important and necessary contribution to the program of industrial education. Only through a program that includes a study of industry is it possible to effectively meet all the objectives claimed for industrial arts or industrial education.

AMERICAN INDUSTRY COURSES FOR THE SECONDARY SCHOOL

When considering the body of knowledge called industry in relation to the needs of students and the time limitations of the school curriculum, it seemed most suitable to develop three courses in American Industry for the secondary schools. In the American Industry program, these courses are called Level I, Level II, and Level III.

Level I American Industry meets the objectives to develop a knowledge and understanding of the major concepts of industry and their relationships and to develop the ability to solve simple problems related to industry. It is designed to be a required course for all students at about the 8th grade and is a one-year course meeting five periods a week.

The Level I course outline (Figure 4) consists of seven units, starting with a teacher-directed introductory unit on Industry Today and progressing through Unit II, The Evaluation of Industry; Unit III, Organizing an Enterprise; Unit IV, Operating an Enterprise; Unit V, Distributing Products and Services; Unit VI, The Future of Industry; and Unit VII, The Student's Business Venture. Units III, IV, and V provide the content for the 13 basic concepts. In Unit VII, the course becomes student-directed as the students apply their knowledge of the concepts of industry in a student enterprise involving organizing, operating, and marketing.

Level II is designed to follow Level I and meets the objectives to develop in-depth understandings of the concepts of industry and refined understandings of the relationship among the concepts and to expand the ability to recognize and solve complex problems related to industry. Level II is recommended as an elective course for all students who have completed Level I. It is a full-year course meeting five periods a week.

Level III American Industry is primarily an independent study course designed to meet individual student needs at the 11th or 12th grade. The stated goal of Level III is to develop knowledges and problem-solving skills within a concept area or cluster of concept areas appropriate to the individual's level of ability and interests. Level III is not meant to be a vocational or capstone course, although it does intend to meet the special interests and needs of students on an elective basis.

INSTRUCTIONAL MATERIALS

Instructional materials for American Industry have been developed in such a way as to relieve the teacher of the chore of generating his own teaching aids. Instructional materials consist of an instructor's guide for each of the three levels, instructional media for the first two levels, and student booklets for Level I.

The instructional media includes overhead transparencies for most lessons, slide series and a filmstrip for some of the areas, a 16-mm film on American Industry, and film catalogs of suggested films for the 13 basic concepts.

Instructional media, student booklets, and the lessons in the instructor's guides are coordinated to provide the teacher with content, instructional aids, activity, and evaluation for the entire courses.

ACTIVITIES

Many educators fear that the broad general nature of American Industry makes it a verbal course, in contrast to the physical activity usually associated with traditional industrial arts. Such fears are unfounded when one realizes that the conceptual nature of

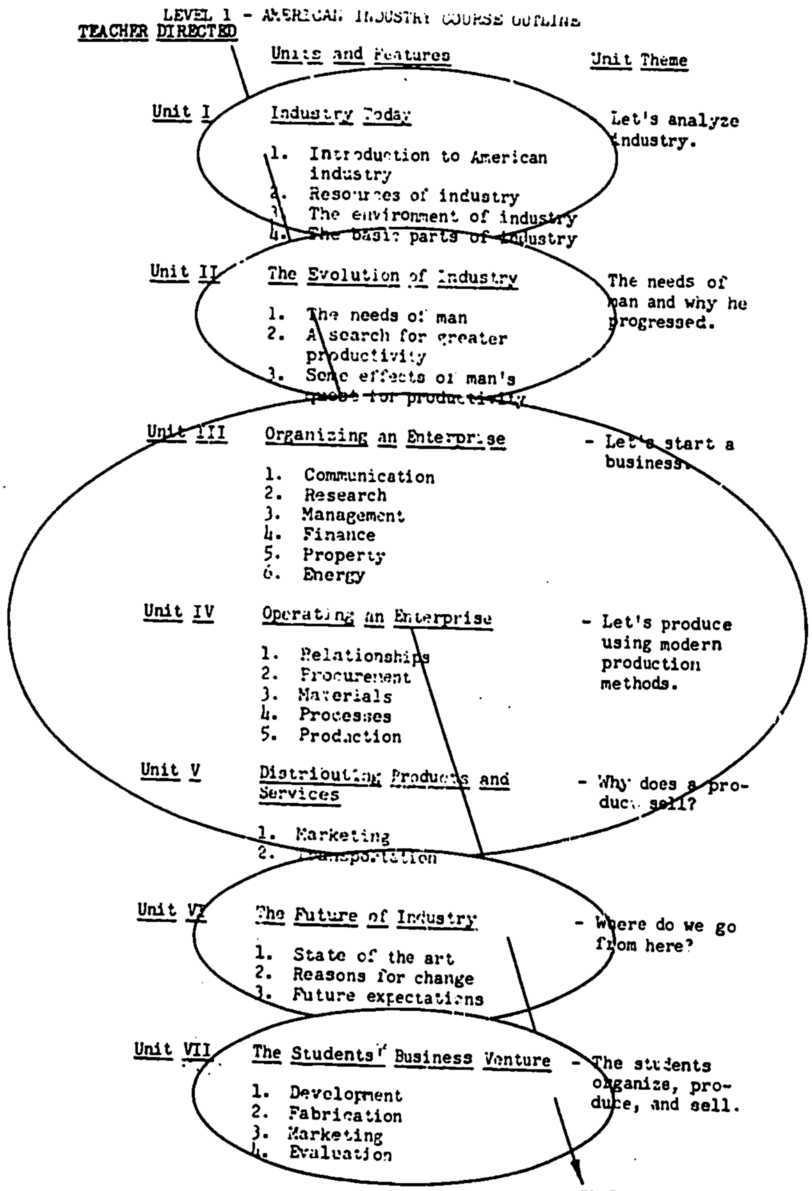

Figure 4

American Industry makes activity essential to the desired learnings. Activity for American Industry must be of a problem-solving nature related to all the areas of industry rather than being limited to project activity centered in processes and materials.

Some activities in American Industry are short and part of a single lesson. Other activity may be long enough to meet the needs of several lessons or all the lessons of a single concept. Continuing activity in the form of a student enterprise may cover all the concepts or a group of concepts. The need is for activity which reflects real transactions in order to develop concepts.

Too often, awareness of the potential for American Industry and its place in the industrial education program is misunderstood because of failure to perceive the unique aspects of American Industry. Foremost is the need to realize that the social institution of industry is the source of content for American Industry, whereas technology is usually the source of content for traditional courses in industrial arts.

American Industry is based on broad concepts or understandings of industry rather than on facts or figures.

American Industry utilizes a broad range of problem-solving activity related to all of industry rather than a project approach to technology and skills.

American Industry meets all the criteria necessary to be considered a discipline, especially in schools where the identification of disciplines is necessary for integrated and interdisciplinary approaches to education.

PLACE OF AMERICAN INDUSTRY IN THE INDUSTRIAL EDUCATION PROGRAM

American Industry is intended to strengthen and validate the philosophy and goals of industrial education. The concern that American Industry threatens the total program of industrial education is erroneous. As American Industry achieves goals which were previously ignored or weakly met, it gives more meaning to all of industrial education. If American Industry threatens to replace some phases of industrial education which have not made a substantial contribution to the program, it establishes a more effective and secure place for industrial education in the school curriculum.

Using what could be an industrial education program for a modern school (Figure 5), consider the place of American Industry as it meets the objectives of developing an understanding of industry and problem-solving abilities related to industry. American Industry Level I introduced at the 8th grade and followed by Level II would achieve the general education purposes of career orientation and exploration. These purposes accomplished

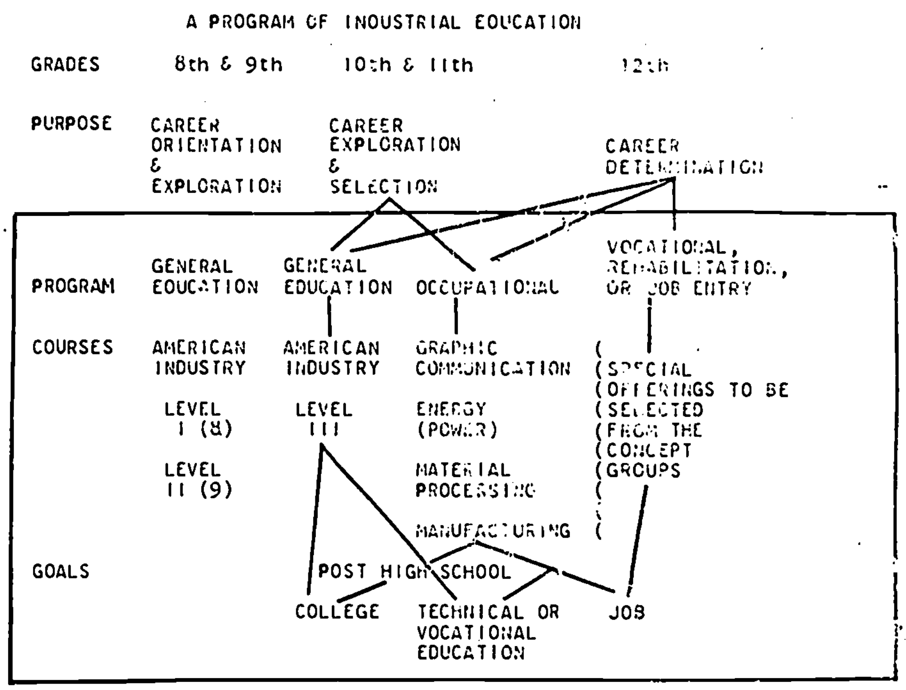

Figure 5

by the study of industry would be associated with the social institution of industry and would include an awareness of management, finance, relationships, and all the broad concepts of industry rather than only a few materials and processes. Level III American Industry, offered any time after Level II but preferably in the concluding years of high school, would provide for the individual needs of students. Independent study of a special interest area in preparation for engineering, technical education, or employment would be logical goals.

American Industry provides a conceptual background for a contemporary organization of other industrial education courses such as energy, graphic communications, manufacturing, or materials and processes.

WHAT DOES AMERICAN INDUSTRY DO FOR THE STUDENT?

Advantages to be gained by the student of American Industry are an important factor in modern education. While the goals of the courses are of direct benefit to the student, these goals are involved in many other factors affecting a student's education and his adjustment to his work life.

Students progressing through American Industry as their introductory experiences are not locked into a course sequence. A student who has completed two or three years of American Industry has a broad background of understandings which allow him to choose a great variety of directions for his specialization or concentration. A change of plans or interests does not make it necessary for the student to recycle through a new sequence of courses, for American Industry has provided the kind of general background from which the student can take a new direction. Not only does this apply in industrial education where a student might change from a metalworking orientation to a photography interest, but he might as easily move from a materials and processes orientation to a business and management interest.

As was suggested in an early portion of this presentation, American Industry's conceptual understanding of industry provides an unusually wide choice from which a student may make a career selection. Rather than selections of limited scope such as welder or cabinet maker, choices can now be made from such broad areas as production, research, finance, management, etc.

As a student understands all the aspects of industry, he is able to relate his occupational choice to all the various functions of industry. He then understands how his career relates to finance, to marketing, and to all such functions which are vague and unreal to many present-day workers.

Of great importance to the total school curriculum is the realization that the experiences in the American Industry courses help to discover and develop interests and aptitudes of an academic nature as well as non-academic. In so doing, American Industry serves all students as well as the multifaceted interests of each student.

Because of the conceptual nature of American Industry through which students develop understandings, young people are better prepared to adapt to change, both in and out of school. Facts and specifics change easily, but understandings remain reasonably constant over longer periods of time.

CONCLUSIONS—WHAT IS AMERICAN INDUSTRY?

American Industry is a new direction for industrial arts, intending to develop a better understanding of industry, using industry as its source of content.

American Industry is a general education course organized to provide articulation (or a bridge) between general education and future occupational selection.

American Industry is a practical foundational base for most occupational or career choices.

American Industry prepares young people to adapt to change.

American Industry is a discipline in that it has an identifiable structure and a unique method of inquiry.

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Industrial What?

Ted S. Jones

One of the most pitiful sights in the world is an industrial arts graduate trying to talk to someone from industry. It is a rare company that has one man who knows what industrial arts means. It is still rarer to have this person in a position to recruit I.A. people for industrial jobs. We are not disliked, or our qualifications questioned, or our talents laughed at. Indeed, any of these things would be welcome because at least they would acknowledge our existence. We are a completely foreign major to what is supposed to have been our parent—industry.

The only people who understand the term industrial arts are people who are in the industrial arts field. Even our fellow educators are not familiar with our field. You know good and well that you are the shop teacher if you teach anywhere below the college level. Certainly, we teach shop, but that should not be all we do. Industrial arts is more than a shop teacher, or else the title of this conference is ridiculous.

I taught school when I first graduated. I had majored in industrial arts, however, and I wanted in industry. An IA man seeking a job in industry can become a neurotic in a week. If you are lucky enough to even get an interview with a personnel man, you spend the first 10 minutes educating him on just what you majored in at college. These people have some weird ideas. Industrial arts? We don't have any openings for illustrators, or artists. When you manage to get the idea across, "Oh, you were a shop teacher" or "Oh, you taught manual training." So you have spent the first 5 minutes of your interview explaining to the man what you majored in, and you will now spend the next 5 minutes explaining that industrial arts is more than teaching a youngster how to make a lamp or repair a carburetor.

Two cows were standing beside the fence at a large dairy, and a milk tank truck drove by. On the side were large red, white, and blue letters stating, GRADE A MILK, HOMOGENIZED, PASTEURIZED, VITAMIN A, B, AND C ADDED. One cow turned to the other and said, "Makes you feel a little inadequate, doesn't it?" Well, sometimes I felt a little inadequate in just trying to tell people about industrial arts.

I still have a problem today in convincing management that industrial arts graduates go to college 4 years and receive a degree when they graduate. We are not and have not communicated with the supposed parent of our field . . . industry. Now whose fault is this? Is the name industrial arts misleading? Have the people in the field allowed the passage of time to let us slip away from industry? I don't know the answer, but I do know that industry does not know of our existence.

I therefore propose a campaign to educate the public and industry about our major. This program would be carried on at two levels. First, we would use the IA people presently teaching at the high school level or below. While part of this proposal is aimed at bettering our IA image, it is also a suggestion aimed at helping the kids.

Today the big push is for everyone to go to college. This is not possible, as you know. What happens to the kid who can't or won't go to college? There are millions of government-sponsored trade schools and programs that will teach him a trade, but how does he know what trade he wants or might find desirable and interesting? Can he afford to go to the school?

This is where I think we as industrial arts teachers can make points for our profession and at the same time help the kids. What I am suggesting is the same principle as the Job Fairs held in many cities, but not on such a scale. I think we can make points by inviting the local people in the communities we teach in to participate in the exposure of their particular trades and crafts to the kids. What would be wrong with inviting the local auto mechanic, or brick layer, or carpenter, or electrician, or any trade to come to your school and talk to your classes? Tell these kids their role in the economy of the community. How does a mechanic live? What are the working conditions? What kind of future would they have? What's the best kind of training? The local people would jump at the chance. It's always an honor to be asked to speak before any group, and the people in these particular crafts don't get much of a chance to do so. At the same time, these people would look at the industrial arts function as more of an educating job and less of a "shop teacher."

Of course, the IA teacher should help the image as much as possible during the visit by showing the man around and explaining that he teaches more than how to make a lamp.

If the local IA man has the ability and the desire, maybe he could wrangle some invitations to speak himself before civic groups or clubs. We are going to have to sell this program ourselves at the grass roots level. No one is going to help us because they don't know who we are.

Don't call your classes "shop." IA people must become counselors. Help these young people to find a vocation that interests them before they graduate or before they get bored with our curriculum designed for college preparation only. My dream world for industrial arts would be a curriculum that would expose all students, boys and girls, intellectual and average, advantaged and disadvantaged, to the complete spectrum of the business world. Let them see and understand all levels of the working world. Give them the alternatives and counsel them to the right choice. This should be done prior to high school.

My dream world contains separate routes for those destined for college and those who "opt" out. We need a system of technical high schools. Do not call them manual arts, for heaven's sake. These schools could give a four-year specialized course in many fields for those students who have found an interest and a general industrial course for those still undecided. Our co-op programs could also work in conjunction with these schools to provide income and practical experience to the student and thus reduce dropping out.

We are going to meet a great deal of resistance from our academic brethren on this. What I propose is a massive expansion of the IA field that would take time from the normal educational disciplines. It would also infringe on the "college or else" mentality and on the traditional role of our counselors. Our fellow educators do a fine job of preparing their people for college. We are being negligent in our obligation to those who do not choose college if we don't do the same. We must EXPLORE industry with the students, COUNSEL them on their choice, and ROUTE them in the proper direction.

We now have in these great United States over 41 million high school graduates. In addition, in our high schools today there are over 14 million students and in our colleges over 7 million students. Three out of four babies born between 15 and 20 years ago will be high school graduates. Over 22% of these will obtain Bachelor degrees in college. By 1975, we will have over 76 million high school and college graduates in these United States.

As you well know, all parents want their children to have an easier life than they had. Most parents want their children to complete high school and to go on to college. Unfortunately, many of these students are not learning a skill they can sell to employers. Most are not even aware that in order to satisfy our needs and desires we must work. They want the same standard of living and luxuries which their parents enjoy after years of hard work and saving. Because of their education, they think their talents are not being used and that there is no opportunity to move ahead.

Amelia Nugent, in an issue of Monitor, wrote, "If I had a son, I'd tell him to be a plumber," after searching for several days to find a $9.75-per-hour plumber. Unfortunately, Mama doesn't want her son to become a plumber in this day and age, nor do most fathers. She wants him to become President or, at least, president of his own company. What have we done to condition parents in this way?

Somewhere along the line we have promoted the idea that work is not a nice four-letter word, that work is somehow demeaning, that intelligent people are supposed to possess college degrees and spend their lives directing, planning, researching, supervising, managing, teaching, or studying. This false white-collar pride is resulting in a serious labor situation. No one wants to be a worker, particularly a good worker, with pride in what he does. Our kids are told to go to college to be successful. They are not even told to go to college and work hard to be successful. They are not inspired to go to college on the basis that they might be of service to mankind. They are told that college is a passport to affluence, a way of avoiding a life of hard labor. Nobody tells them that the purpose of education is to enrich life, to increase one's capacity for enjoying and understanding life, and that education is a lifelong process, not merely a four- or five-year cram session for the sake of making an extra buck.

It may be that some of the students who are screaming for relevancy in college should have gone to work instead of to college. College is a place to learn how to learn. It was never supposed to be relevant. But you can't tell kids to go to college so that they can make a lot of money and then wonder why they scream for relevancy. Materialism begets materialism. And no one ever told them that, after college, they might quite properly decide to become plumbers, carpenters, masons, or auto mechanics. Maybe someone should, and I say he should be given at least the exposure to other work systems before he goes to college. This should be done by the on-campus representative of the business world—the Industrial Arts teacher.

The second phase would be on the college level. Here we are going to aim our sights at industry. We hope the high school level people will be able to sell the public, and our college level should be devoted to getting the story across to industry. Our IA graduates can perform a multitude of valuable jobs for industry. I have IA people working as shop superintendents, time study men, estimators, and draftsmen.

I might as well stop right now and explain to you that I had a dickens of a time ever getting my first IA man in our company. We hire about 700 people per year, of which about 50 are college men. I am director of industrial relations and in charge of all of our personnel offices and personnel directors, and I still had a time getting anyone to even talk to an IA graduate. I had to educate every personnel director I had, and then each individual department head, and finally I got some IA people hired. Without exception, those departments that did old Ted a favor by hiring a shop teacher friend of his are now requesting IA if possible when a vacancy occurs.

We can measure up if we can only get our chance. But how many personnel men are ex-IA people? Very few; therefore, most companies remain in the dark about our degree. I propose that our college-level IA men make overtures towards industry. Why not prepare brochures and mail them to as many companies that might use our people as possible? Why not put brochures in the college placement office? Put posters in the placement office. Brief the placement people and sell them, so when a company comes in looking for a certain type of graduate, the IA department will not be forgotten. I'll bet you a silver dollar that if you have not spent some time educating your placement people lately they are not familiar with your curriculum and don't think of your graduates as anything but "shop teachers."

Industry is not going to come to us... we are going to have to go to industry. Our corporate image is not just lousy... it's non-existent, and it's going to take a lot of work and education to change it. To quote H. G. Wells in his Outline of History, "Human history becomes more and more a race between education and catastrophe." Let's change the word human to industrial arts. It's a race, gentlemen. We either educate or face catastrophe.

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Representative Addresses from the Major Group and Special Interest Sessions

Accountability

Specifying Objectives for Industrial Arts Students at Lincoln High School, Gahanna, Ohio

David L. De Pue

The time is approaching when educators will be held accountable for student achievement. No longer will teachers be allowed to justify their activities with broad sweeping goals. This view is manifested by the U.S. Office of Education (Marland, 1971) and the majority of the nation (Gallup, 1971).

This concept of accountability implies that professional educators are responsible for providing each student with learning activities which will challenge his cognitive, affective, and psychomotor domains of learning (Tyler, 1970; Bloom, 1956).

For an instructional program to be considered accountable, a method must be provided to assess student achievement.

If the purpose of education is to change behaviors, then course objectives should be stated in terms of behaviors expected to result from the learning situation (Ojemann, 1970). Too often, course objectives are pre-occupied with someone's notion of the knowledge, understanding, and attitudes which might induce the desired behaviors. These traditional approaches to evaluation tend to be subjective and vague (Popham, 1971).

BEHAVIORAL OBJECTIVES

A behavioral objective can be defined as a specific statement of student performance which is measurable or observable (Mager, 1962). A statement of objectives should specify what the learner will be able to do, in addition to how well and under what circumstances he is expected to perform (Banathy, 1968). These objectives, stated in behavioral terms, are to be the basis for evaluation by both the teacher and the student. Such a criterion also provides a means by which others can rate the quality of the educational program.

EXAMPLES OF EVIDENCE WHICH SUPPORT THIS APPROACH

Recent research studies indicate that the achievement of students is significantly better when they are made aware of their expected outcomes (Doty, 1968; DePue, 1971; Mongerson, 1971). In each of these studies referred to, the students were given a list of objectives before instruction was begun. These objectives were written in terms of observable action which the student might display under given conditions after being exposed to the learning activities.

Have you ever noticed that often you (or your students) seem to achieve better after the first test in a given course? This could be the only means by which a student may become aware of the real course objectives (Mager, 1962).

ARGUMENTS AGAINST USE OF BEHAVIORAL OBJECTIVES

The most basic argument is offered by Robert Ebel, who states that it is not the behavior which we seek but "the knowledge and understanding, the attitudes and values which induce the behavior. . . ." (Ebel, 1970, 171).

Edward Morrison has stated "If 'understanding' something is important, then it is important because students who 'understand' are able to do something. . . ." "The concept 'understanding' is a label applied to individuals who demonstrate a particular set of capabilities. Performance objectives simply require that we specify the capabilities, however complex or simple, an individual must acquire in order to qualify as 'understanding' what is taught" (Morrison, 1966, 10-11).

You may concur that understanding, attitudes, and values are extremely difficult to measure. Knowledge is what we usually attempt to measure. James Popham et al. (1971) is concerned that in trying to measure knowledge, we may merely measure the learner's achievement on a true-false test.

In Robert Ebel's second argument, he admits overt behavior is a useful indicator of learning, but feels it is confusing to think of behavior in terms of educational goals.

It is obvious that society knows generally what behaviors their young must exhibit as a result of schooling. For a time, teachers may promote "knowledge" in the classroom. But if the youths' behaviors deviate greatly from these society-mandated goals, the public will begin looking elsewhere for more accountable means of educating their young (Komisar and McClellan, 1965; Elam, 1971).

Another opponent feels that to spell out in advance how the learner is supposed to behave after instruction seems undemocratic (Arnstoine, 1964).

By its very nature, any teaching of others must be undemocratic. But, the important point is that teachers and society know generally what behaviors they wish to promote. This is the purpose of public education. We must try to be more specific about these goals (Komisar and McClellan, 1965).

A fourth argument infers that because teachers rarely specify their goals in terms of measurable learner behaviors, we should be realistic and not ask them to (Jackson, 1966). It is becoming evident that the way teaching exists at present isn't good enough (Popham, 1968; Marland, 1971; Gallup, 1971).

A fifth argument is that only trivial behaviors seem to be used as objectives, such as those outlined by Robert Mager (1962).

One advantage of behavioral objectives is that trivial goals are easy to identify once put into these operational terms. They can then be rejected as unimportant and replaced with worthwhile objectives. This is the only way in which unimportant goals can be identified (Popham, 1968).

A sixth argument is that the teacher "artist" exploits unexpected opportunities in the classroom. It is often these unanticipated results which are really important.

In terms of pupil growth, such methods usually would be revealed as pupil entertainment or a temporary diversion (Popham, 1968). Popham goes on to say, "Prespecification of explicit goals does not prevent the teacher from taking advantage of unexpectedly-occurring instructional opportunities in the classroom; it only tends to make the teacher justify these activities in terms of instructional ends." In short, if these generated outcomes are really dramatic, plan them in the curriculum so that we may achieve them every time.

HOW TO BEGIN A RATIONAL PROGRAM

Behavioral objectives are used by the educator to select appropriate subject matter from the field under study (Gagne, 1968). How else might the teacher know what material to present to each unique group of learners? Certain students, when made aware of these instructional outcomes and evaluative criteria, will become responsible for their own learning. The instructor may have to do little else (Mager, 1962).

Educators who have formulated their course objectives have made a beginning. The question to be asked now is what are the students' current abilities, and what are their needs? To answer the second part, an assessment must be made of the needs of the community and of society as a whole. What strengths can these children gain which will enable them to meet the needs of our community and our society?

The next step is to pattern these objectives after responses desired of the students after completion of the course, the course being the set of guided learning experiences devised to promote these objectives. Further modification may be necessary to state these objectives in terms of the goals the children themselves attempt to reach through their activities.

At the first class meeting, these objectives must be formulated again, with the children as participants. Stated in terms of the students' motives, these objectives become the children's own goals. These now become the means of evaluation by the teacher and the student as well. (These are based on a summary by Anderson et al., 1950.)

POINTS TO OBSERVE WHEN WRITING AND USING BEHAVIORAL OBJECTIVES

As specified by Mager (1962) in the final summary of his book:

1. The objective should describe one of your educational intents.
2. Your intent will be communicated to the degree that you have described what the learner will be doing when demonstrating his achievement and how you will know when he is doing it.
3. To describe terminal behavior (what the learner will be DOING):
   a. Identify and name the over-all behavior act.
   b. Define the important conditions under which the behavior is to occur (given and/or restrictions and limitations).

c. Define the criterion of acceptable performance.
4. Write a separate statement for each objective: the more you have, the better chance you have of making clear your intent.
5. If you give each learner a copy of your objectives, you may not have to do much else (p. 53).

ELECTRONICS AT LINCOLN HIGH SCHOOL

Preparation

The preparation of the original course of study was made following the recommendations previously stated and taken from Anderson et al. (1950). These recommendations take into consideration the goals of general education, the needs of future citizens in our community, and the needs of our society. Further consideration must be made of the recent policy statement concerning career education by the U.S. Commissioner of Education (Marland, 1971).

The goal of this course is to enable students to continue learning (about electronics) after leaving school. The student would continue learning in his chosen situation, be it college, technical school, trade school, or a position in industry. Several behavioral objectives were devised and learning situations planned.

Class Involvement

At the first class meeting, course goals were discussed and specific objectives were formulated by the group. At the following meeting, the students were given a topical outline and a list of specific objectives written in behavioral terms. Most of these had been discussed at the previous class meeting.

Objectives in Use

During the course, in lessons, experiments, demonstrations, and other activities, including reviews and discussions, the instructor mentioned the appropriate objectives. Here it is necessary to re-phrase, abbreviate, and abridge whenever possible to reinforce and make clear the intent. That is to say, the objective should not be used in a formal manner consistently.

Class discussions will enable the objectives to be used in course and group evaluation. Such discussion will also generate new objectives which can be set in behavioral terms.

Evaluation

When you are aware of the established criteria, you may use an array of evaluation devices. These may include observing laboratory performance, casual inquiry, written and/or oral statements and, of course, formal quizzes. The construction of any tests will be greatly aided as a result of having objectives stated in specific terms. Several test items can be taken from each statement of objective, to insure satisfactory progress.

SUMMARY, OBSERVATION, AND RECOMMENDATION

Summary

It has been the purpose of this presentation to cause educators to see the need for developing a defensible learning program in their classrooms. Evidence was offered to support a suggested approach. This was followed by an attempt to refute possible arguments. Some direction was outlined relating to the use of behavioral objectives in the course of study development. Lastly, an operating situation which employs behavioral objectives was described in an attempt to demonstrate the effectiveness of this approach.

Observations

An occasional student can achieve many of these objectives before being exposed to this learning situation. The educator may now take the appropriate action to prevent this student from experiencing high anxiety or complete boredom.

A student can quickly see if this course will provide him with the knowledge and abilities that he is seeking. If he decides that he is not in the right place, a change can be made while still practical.

The student is constantly aware of his progress, his accomplishments, and abilities. This serves as much more meaningful reinforcement thanmarks in a gradebook or pages in a notebook.

These objectives become the learner's objectives. This begins to get the student involved in his own learning and in helping his classmates to learn. Now the teacher and student can be on the same team.

The student, the parent, and the community will evaluate your program, whether they are aware of the criteria or not. Behavioral objectives give them positive criteria to use. If they are pleased with the evidence, they then will assess the program favorably.

Recommendation

Industrial arts teachers should be among the first to consider educational accountability. The use of behavioral objectives seems to offer a favorable approach.

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Performance Contracting

Max Farning

A performance contract in education is a contractual agreement between a buyer and a supplier. The buyer usually is a local school district which agrees to exchange their dollars for the educational resources of the supplier. The supplier usually is a corporation, either profit or non-profit, which agrees to deliver the resources. The resources may include software, hardware, teachers, administrators, and methods of instruction. As implied in the term "performance contracting," it is a contract which is based on performance; as the performance of the supplier increases, the buyer agrees to deliver a greater amount of money for the increased level of performance; but as the performance level decreases, the supplier agrees to accept a lesser amount of money. Both the purchaser and the supplier agree that the level of performance will be determined (or measured) by subjecting the students to tests which hopefully measure the knowledge that they have acquired; hopefully, the tests measure what both the buyer and the contractor desire them to measure. That is, the tests have validity.

Performance contracting very probably is the result of a general discontent of the United States public with the achievement of our educational system. While costs were rising, it was being realized that a large number of youth were leaving school with very limited abilities to function and be productive in our society. Certainly, having large numbers of students leaving school with very limited cognitive development is nothing new, as this has been going on for as long as schools have existed. But what is new is that for the first time the general public is becoming highly concerned about the problem of the lack of cognitive development of its youth. The public wants and is demanding an improved system of delivery in our educational system. Performance contracting is one form of accountability.

Performance contracting, at least as we speak of it here today, became an actuality in 1969 when two school districts signed a contractual agreement with a supplier who would supply resources to educate their children, with a portion of the payment being dependent upon the students' scores on tests. We do not know how many performance contracts were signed for the school year 1970-1971, but it is estimated that there was a minimum of 100.

In performance contracting, what is really contracted for is student achievement. We as consumers want our money's worth. When we buy gasoline for our automobile, we are concerned about the quantity and the quality of the gasoline, the quantity being measured in gallons and the quality being measured by the octane rating. How can we make certain that we are getting our money's worth when we purchase educational resources—books, projectors, buildings, and services of teachers and administrators? The concept of performance contracting, as we now know it, makes the assumption that we can determine the efficiency of an educational system by subtracting the students' pre-test scores from their post-test scores and dividing this gain score by inputs which we measure in dollars. Other assumptions are that the tests are valid and that the students' performance on the tests is consistent with an acceptable level of effort.

In nearly all performance contracts to date, an agreement has been made between the local school district and the contractor that students would take one test prior to the learning period and a second test at the completion of the learning period. A gain score would be computed by subtracting the pre-test score from the post-test score. The size of the payment would be positively related to the students' gain scores.

Because performance contracting depends on our being able to measure students' learning, nearly all performance contracts have been let in two subject areas: mathematics and reading. Of the more than 20 performance contractors that this author contacted, only one said they are interested in performance contracting in industrial arts. A few performance contracts have been let in various areas of vocational education.

Because of reported successes in performance contracting in 1969, many school districts throughout the United States were becoming extremely interested in performance contracting to meet their educational needs. To put it quite simply, many people in the United States, especially school board members, were beginning to feel that performance contracting was the answer to our educational dilemma—a system of education which was failing to educate a large number of students. Two events were occurring simultaneously: local school districts which had no experience with performance contracting were entering into performance contracts for either all or a portion of their educational needs, and pressure was being applied on the government at the federal level to invest resources to evaluate the effectiveness and efficiency of performance contracting. The result of these two events was that the United States Office of Economic Opportunity committed approximately $6,500,000 to evaluate performance contracting during the 1970-1971 school year. The Office of Economic Opportunity needed commitments from three resource groups: local school districts who were willing to do performance contracting under the auspices of the Office of Economic Opportunity, corporations who were willing to commit themselves to performance contracting in education, and an organization which would monitor the experiment, gather the data, analyze the data, and prepare the necessary reports.

THE HYPOTHESIS

The over-all hypothesis was that students who were disadvantaged relative to the United States norm in their acquired abilities in mathematics and reading would learn more in these two areas if they were taught under performance contracting than if taught under the traditional methods of education.

SELECTION OF THE SCHOOL DISTRICTS

The Office of Economic Opportunity had a list of over 200 school districts throughout the United States who indicated interest in performance contracting. Upon an Office of Economic Opportunity request for proposals, 77 of these more than 200 school districts submitted formal application to participate in the experiment. Of these 77 who submitted formal application, 18 were selected to participate. Among other selection criteria were the following:

1. Eighty percent or more of the students were to be members of low-income families.
2. There were to be at least 200 students in each of six grades—1, 2, 3, 7, 8, and 9—who were deficient in mathematics and 200 who were deficient in reading. One-half of these 200 would be in the control group and the other one-half would be in the experimental group. (In these school districts, this 100 (one-half of 200) student figure was later reduced to 75 so that small and rural districts could be included in the experiment.)
3. The school district must have recent, valid data on the students so that reasonable assessments could be made as to who should be in the control groups and who should be in the experimental groups.

The 18 school districts which were selected were as follows: Anchorage, Alaska; Athens, Georgia; Bronx, New York; Dallas, Texas; Fresno, California; Grand Rapids, Michigan; Hammond, Indiana; Hartford, Connecticut; Jacksonville, Florida; Las Vegas, Nevada; McComb, Mississippi; Philadelphia, Pennsylvania; Portland, Maine; Rockland, Maine; Seattle, Washington; Selmer, Tennessee; Taft, Texas; and Wichita, Kansas. Thus, there were 4 large districts; 9 middle-sized districts; and 5 small districts.

SELECTION OF THE CONTRACTORS

A total of 31 corporations submitted competitive bids in response to a request for bids from the Office of Economic Opportunity. Most of these 31 corporations were already in the educational industry, as many were publishers and distributors of books or producers and distributors of hardware which was being consumed in the classrooms. There was considerable variation in the bids between the 31 firms in the emphasis that each placed upon hardware, software, student incentives, student-teacher ratio, student-teacher aide ratio, and proposed teaching methods.

The six companies which were selected as a result of the competitive bidding were Alpha Learning Systems, Inc., Singer/Graflex, Inc., Westinghouse Learning Corporation, Quality Educational Development, Inc., Learning Foundations, Inc., and Plan Education Centers, Inc. Each of the six companies selected then contracted in three school districts.

MONITORING THE EXPERIMENT

Battelle Memorial Institute of Columbus, Ohio, was selected to monitor the experiment, gather and analyze the data, and prepare the reports.

The effectiveness of the experiment was determined by administering standardized mathematics and reading tests to both the experimental and control students during the first 10 days of the school year 1970-1971 and again during the last 15 days of the same school year. The pre- and post-tests were alternate forms of the same test. Seventy-five percent of the payment was directly related to the students' gain on these tests. The other 25% was related to tests during the school year. The control group was established to determine if the students who were learning under conditions of performance contracting made greater gain scores than students who were learning under the traditional educational structure.

Battelle Laboratories, together with a representative from the Office of Economic Opportunity, selected the pre- and post-tests. Personnel representing Battelle Laboratories monitored all testing situations. In two districts, a second pre-test was administered because Battelle Laboratories felt the validity of the first pre-test was suspect due to extremely humid weather, student fatigue, disruptive behavior, and poor physical conditions.

DATA ANALYSIS

Regression analysis was used to analyze the data. The students' post-test scores were the dependent variables, with the students' pre-test scores and group membership, either the control or experimental group, being the independent variables.

THE RESULTS

The data, after being subjected to rigorous statistical analysis, appear to reveal no real differences in students' gain between those taught under performance contracting and those taught under the traditional methods.

Has performance contracting failed as a method of enhancing student learning? Probably the school districts, the contractors, and the regulatory bodies have operated in such a state of confusion, pressure, and haste that little real evaluation is possible. Additional research with performance contracting should be conducted, using our past experience and findings as a base from which to develop future experiments.

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Aerospace

Aerospace Programs for Industrial Arts

William C. Treadway

The concept of an aerospace-oriented program for industrial arts or other general education classes is not new, nor was it originally initiated at Miami University. Aviation and/or aeronautics has long been an area of interesting and intensive study at most institutions of higher learning, as well as in elementary, junior, and senior high school programs. Furthermore, aerospace education is not out of phase with the City of Dallas. Charles H. Boehm, Superintendent of Public Instruction, Commonwealth of Pennsylvania, stated in a foreword in Earth and Space Science, a guide for secondary teachers, "The idea for the Earth and Space Science guide was conceived at the 1958 Air Force Convention in Dallas, Texas, where for the first time the swift progress being made in astronautics was demonstrated to a group of educators."

WHAT IS AEROSPACE EDUCATION?

"Aerospace," a contraction of the words "air" and "space," is a term used to identify the entire region that consists of the earth's atmosphere and the space beyond. "Aerospace education" is that branch of general education concerned with communicating knowledge, skill, and attitudes about aerospace activities and the total impact of air and space vehicles upon society.

"Aerospace education" must be distinguished from those branches of special education known as aeronautical and/or astronautical education, which are concerned with training specialized aerospace workers. These aerospace workers, and specifically the aerospace sciences, have generated dynamic humanistic forces that are significantly changing the social, economic, political, and cultural structure of our nation and the world. A growing need exists for education opportunities that will provide authentic familiarization with aviation and space progress and objective interpretation of the effects of air and space vehicles on our way of life.

MIAMI UNIVERSITY AEROSPACE EDUCATION PROGRAM

The Aerospace Education Workshop started 17 years ago as an Aviation Workshop. The program had good attendance and was firmly established when a couple of years later a national Aerospace Workshop was held at Miami University with over 300 students participating. Representatives from all 50 states and various countries of the world were involved in aerospace technology.

The Aerospace Program is conducted by Miami University, Oxford, Ohio, in cooperation with the Aviation Division of the Ohio Department of Commerce, the Ohio Wing and the Great Lakes Region of the Civil Air Patrol, the U.S. Air Force, the Federal Aviation Administration, and the National Aeronautics and Space Administration.

The objectives of the Aerospace Program are: first, it is intended as an orientation to give broad aerospace insights to educators of all subjects and grade levels. This is accomplished through attendance and participation in lecture sessions, listening to outstanding aerospace speakers, experimenting in laboratory projects, participation in small-group seminars, taking part in a supervised flight laboratory instructional program, and educational excursions to aerospace industries, airports, and air force bases.

The second purpose of the program is aimed at developing competencies in the world of aerospace education for those seeking a master's degree. Again, exposure to as diversified and qualitative a program as time and energy will allow is the base for developing competencies within this select group.

SIMULATION IN AEROSPACE EDUCATION

The role of aerospace education at Miami University is to orient the classroom teacher, school principal, guidance counselor, etc., to the world of aerospace. Through a hands-on approach, teachers are involved in aerospace activities and then are able to relate these experiences back to the classes by simulation.

Students enrolled in the program became so enthused with the concepts of flight, rocketry, meteorology, navigation, weather, earth, solar systems, galaxies, physiology, flight sciences, physics, aerodynamics, astrodynamics, etc., that they desired some method to duplicate these experiences for their own students. One method to accomplish this goal is simulation. Many projects have been developed by the students to simulate basic concepts that they were involved with in the aerospace program.

Some of the following items are examples: aircraft instrument panels, three-dimensional models of airplanes, rockets, gliders, jet engines, solar systems, weather stations, meteorology equipment, etc.

Recently, while visiting a 4th grade class in a local elementary school, the teacher, Mrs. Sylvia Flint, led her students in simulating a rocket flight to the moon. The program was so involved that you could just see the actual feelings of the students as the rocket was launched, then hear the ohs and ahs as they watched the nose cone separate from the rest of the rocket, and then the exciting recovery. This is simulation in aerospace education.

It is my belief that if we accept the enduring premise that institutionalized education in this nation exists to provide skills, attitudes, and knowledge for its people so that they may live more successful, productive, and happier lives, then public and private education must orient young people to the wide world of aerospace.

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Career Education

The Need for Career Education

Robert M. Worthington

Think back for a moment to your early formative years. Did you have a plan—did your high school help you develop a plan—for the appropriate career preparation and the subsequent job placement that would enable you to enter and advance in the field of your choice? Only you know how much of that route was planned, how much was due to motivation, perseverance, and hard work, how much was the right decision at the right time, and how much was simple good luck.

The point is, there ought to be a better way! And that way ought to be planned and available to all. Industrial arts should be an important part of that career development plan.

I'm sure we agree that much of what is wrong in our society—and I don't discount all the things that are right in this society—has to do with the people who did not get adequate career guidance and training early enough and substantially enough to find their way into productive and rewarding fields of endeavor.

Despite our concerted efforts in recent years to make education more relevant for the children and young people in our schools and colleges, our area vocational and technical schools and technical institutes, the record is still not very encouraging, either in terms of human resources or financial investment. For example:

First, there is increasing segregation between students and the world of work because they feel they are unneeded by our technological society. They argue that since fewer and fewer "bodies" are needed to produce more and more consumer goods, they (the students) are shipped off to educational institutions for temporary internment.

Second, about one-third of all students pass through high school via what is known as the "general education curriculum," a type of education which leaves its graduates neither trained with a salable skill nor qualified to pursue higher education.

Third, there is an undesirable and counter-productive separation of the vocational education, general education, and academic curricula in our high schools, with the result that those in the vocational and practical arts curriculum are often seen as low-status technicians, while those in the academic curriculum emerge with little contact, preparation toward, or qualification for the world of work.

Fourth, because of the widely-held view that a degree is the only kind of respectable occupational preparation in our society, many high school students choose academic preparation. However, a significant number of these do not go on to college, and far more begin college than complete it. In addition, the numbers who do not complete college are increasingly out of proportion to the occupational opportunities in our society. In a free society, no system can guarantee an exact matching between individual needs and educational options, nor should a system purport to eliminate those who "drop out." Nevertheless, the magnitude of these types of discontinuities represents a major problem.

Fifth, the vocational and industrial arts offerings in our high schools, and those students who elect them, are sometimes relegated to second class status. As important and relevant as this type of preparation is in modern industrial society, it often has lower status than academic preparation and therefore does not constitute a real option for many students.

Sixth, our present system is an inflexible one which often results in premature tracking and fails to offer individuals the option of changing direction during their years of preparation or of obtaining new training and shifting occupations later in life.

Seventh, many students have little or no formal contact with, or preparation for, the world of work during their elementary and secondary years. In addition, let me share with you some statistics compiled by the National Center for Educational Statistics. For example, in the 1970-71 school year:

—850,000 students dropped out of elementary or secondary schools. Assume that, on the average, they left at the end of the 10th grade. At $8,000 per child for schooling that began in kindergarten or first grade, these drop-outs, push-outs, or stomp-outs represented an outlay of $7 billion.

—750,000 students graduated from the high school general curriculum that has traditionally been the dumping ground for students who do not elect vocational education or plan to go to college. At $12,000 per student, the total cost to the nation for these students ran about $9 billion.

—850,000 students entered college but left without a degree or without specific preparation for an occupation. On the average, they left at the end of the first year. These young people added $12 billion to costs. If you have been adding with me, you know that we are talking about nearly 2.5 million young people and an expenditure of some $28 billion. That is one-third of the entire $85 billion cost of education as expended by state, federal, and local agencies last year. And these young people and expenditures reflect the drop-out rate of a single year. If you try to include the millions of drop-outs and billions of dollars spent in years past, the losses become astronomical.

What we can never measure are the personal losses of these young people—their frustrations, their shattered hopes and dreams. Nor can we calculate the contributions they might have made to our national vitality and progress. Who are these youngsters? What happens to them? A new Department of Labor study, U.S. Manpower in the 1970's, not only looks ahead but recaps the labor picture in the 1960's. In terms of our social and economic progress, some lines on the charts and graphs for the 60's moved in the wrong direction or, at best, failed to move at all. Teenage unemployment was more than 12% in every year of the decade. The rate for teenagers of black and other minority races was double that, running between 24% and 30%. Most significantly, the gap between youth and adult unemployment rates widened. At the beginning of the decade, unemployment among the 16-19 age group was three times greater than for adults 25 or over. By 1969, over five times more teenagers were out of work than adults.

Projections show that 100 million Americans will be working or seeking work by 1980. That's 15 million more people, mostly young, who will have to be accommodated in the labor force by 1980 than we had in 1970. If 2.5 million youngsters are now leaving our schools and colleges each year without adequate preparation, how many of those 15 million are apt to be unprepared for the demands of the 1980 labor market? Compared with 1968, that market will need 50% more professional and technical workers, but 2% fewer laborers and a whopping 33% fewer farm workers. In parenthesis, let me add that the Department of Labor sees exactly the same number of openings for teachers in 1980 as 1962, about 40,000 fewer than the peak years of the late 1960's.

It is clear, then, that career education is an idea whose time has come. Until we bring career awareness down into the elementary grades—until we give youngsters the desire and motivation to aim for a career that excites them—until we prepare them to leave high school with a marketable skill or to complete work in a college or technical institute or Area Vocational Technical School with a more advanced skill—until we key all these activities to the labor market as it will exist when these students are ready to enter it—until career education becomes an integral part of the educational system, we will continue to short-change both our students and our society.

The career education concept has acquired some impressive endorsements in recent months. President Nixon, in his State of the Union Message, called for a new emphasis on career education, saying that: "There is no more disconcerting waste than the waste of human potential. And there is no better investment than an investment in human fulfillment. Career education can help make education and training more meaningful for the student, more rewarding for the teacher, more available to the adult, more relevant for the disadvantaged, and more productive for our country."

The National Association of State Directors of Vocational Education was one of the first groups to formally endorse the concept of career education and to pledge their support. They pointed out that they see vocational education as an important part of career education, but not synonymous with it. The National Advisory Council on Vocational Education appointed by the President passed a resolution commending the administration for its efforts in career education.

Commissioner Marland and many of us at the U.S. Office of Education have worked for several months in closest cooperation with the chief state school officers, university-based research centers, representatives of school districts, and the professional education association to try to develop a first approximation of what career education could, not necessarily should, be. The chief state school officers support the basic concept without reservations. They have pledged a major effort to gain legislative and public endorsement in their states to use the resources available to them at the state and local levels to encourage the adoption of career education elements in their local school districts. State legislatures, notably Florida, Arizona, and New Jersey, are making the ultimate commitment—they are putting their money where their endorsement is.

The National Chamber of Commerce, the National Association of Manufacturers, the National Manpower Institute, and similar powerful groups are behind the concept of career education. In the past, those of us in industrial arts have thought of the concept of career development as a part of industrial arts. I believe that industrial arts can, by actively doing what this association is doing, become a full partner in this career education effort. I hope that, growing out of this discussion here, AIAA will endorse the concept and pledge its support as a part of it.

The groundswell of interest prompted Commission Marland early this year to appoint an Office of Education Task Force composed of the top members of his staff, the deputies, with the Deputy Commissioner heading the task force, and all the associate commissioners, to take a look at the Office of Education and all levels of education in which we work, to determine how each of us can contribute to this effort, whether we are working in the field of higher education, education of the handicapped, education of the disadvantaged, equal educational opportunities, research development, or any other field in the Office of Education.

The Commissioner has enlisted the support of the Office of Education at all levels. I know that your deliberations here at this conference will generate new ideas and new directions for industrial arts as a part of career education. I would like to clarify just a few things about the developing concept. Career education is not a high-sounding new name for what we have always called vocational education.

—Career education is for every child: rich, poor, suburban, urban, rural, beginning in his first school year and following him as far as he wishes to go in his life.

—Career education is a way to provide career awareness in the early grades and career preparation in the upper grades that continues at an ever-increasing level of sophistication until every student is equipped to enter the occupation of his choice, limited only by his personal ability, desires, and motivations.

—Career education must include vocational education, because we estimate that at least 80% of our young people in the secondary schools should develop salable skills while in school. We hope that, ultimately, the utopian theme of career education would be that every young person who leaves the school system would have a salable skill, would be able to go on to post-secondary academic education, or would be able to go on to post-secondary occupational education.

—Career education is not only for children and young adults. It is for persons of all ages, for anyone who wants to enhance his occupational and earning potential. Two of the four research and development models for career education developed by the Office of Education are pointed specifically toward adults.

—Career education favors no ethnic group to the exclusion of any other. It simply recognizes that concentration and motivation need to be ignited early in life—rekindled later—so that every individual can pursue the occupation and life style of his or her choice.

—Career education is not a rigid program from which no state or school district or adult training effort can deviate. Every state, every community, has a population, an occupation market, and an educational system that differs in some degree from every other. Career education is flexible and can be molded to the unique needs of every state and every community in America.

—Career education is not a restructuring of education that will bankrupt our citizenry. True, start-up costs may be somewhat higher than present per-pupil costs. These costs would include the addition of more guidance counselors, the retraining of those who have to bring career orientation and occupational awareness down to the elementary grades and to the middle schools, and the higher cost of the skill-development training equipment needed at the secondary and post-secondary level.

I should like to emphasize particularly the need for redirecting career guidance and counseling, at all levels, as we develop this concept of career education; in order for an individual to choose a career, he must first know how to make occupational decisions based upon the knowledge and understanding of occupational opportunities.

We at the Office of Education are demonstrating our faith in this career education concept with some concentrated work and funds. I know that you will be hearing more about some of the Career Education Experimental Models later in the program. Let me just briefly say that we have watched six timely projects in communities that represent a cross-section of socio-economic populations. School systems in these six districts have already been moving toward career education for their own needs and interests. These six school-based career education model developing programs are located in Mesa, Arizona; Los Angeles, California; Atlanta, Georgia; Jefferson County, Colorado; Pontiac, Michigan; and Hackensack, New Jersey.

As of last fall, we have asked every state to initiate the planning of at least one state model of career education with federal funds made available through the Vocational Education Act. We have urged every state to include programs of occupational awareness and occupational orientation at the elementary and secondary grades. We have urged every state to include programs of occupational awareness and occupational orientation at the elementary and secondary grades. We have required every state to use 25% of these federal funds for career development, guidance, counseling, and placement activities.

The first of these career education models being researched, the School-Based Model, calls for restructuring of our elementary and secondary schools to familiarize all youngsters with basic information about occupations and to help them get exposure to real-life situations in the middle years, to prepare them in the senior high school to enter either further education or a career field of their own choosing. This model will eliminate, we hope, the general curriculum, which has done nothing to improve the halting action which has led nowhere for many young people.

In addition to the School-Based Model, there are three other career education research and development models. One is the Employer-Based Model, which I understand Dr. Ralph Bohn is going to discuss with you in detail this afternoon. The Employer-Based Model will provide a structure in which industrial firms, businesses, and government agencies will be able to operate work-training courses related to their own employment needs for students still in school as well as for graduates.

Another is the Home-Based Model, using TV, correspondence courses, and other portable audio-visual aids to help the home-bound young adult or the mother in the home.

The last of the four is the Rural-Residential Model. Its first site is a former air force base near Glasgow, Montana, where entire families can live together, train together, and receive all of the education necessary for them to make themselves self-sufficient. This experimental site serves six largely rural western states. The realization of career education cannot be achieved solely as a result of federal funds or speechmaking by U.S. Office of Education personnel. Our action must be red alert, with a reaction taking place throughout the nation.

On February 7, Commissioner Marland convened a panel of scholars representing all of the scholarly fields in education. He brought this panel together to look at the concept of career education from the point of view of the liberal arts educator, the general educator, and the academician who may be fearful that career education would deemphasize the importance of general education; certainly, no one wants to do that. You may be interested to know that one member scheduled to serve on the panel is a past-president of AIAA, Dr. William Micheel, President of Stout State University in Wisconsin. This panel also includes such well-known persons as Dr. Edmond Gordon, a psychologist at Columbia University; Dr. Lawrence Cremine, the Chairman of the Department of Philosophy and Social Sciences at Columbia University; Dr. Garth Mangun, Professor of Economics from the University of Utah; Mr. Albert Shanber, President of the United Federation of Teachers, Local No. 2; Jesse Stuart, the Poet Laureate of Kentucky; and other persons who are scholars in their own right, who are looking at the concept of career education with us to be sure that this concept is not an attempt to push out of the school the important aspects of broad general education, but rather to supplement it and make it more meaningful to all people.

The purpose of this ad hoc committee of scholars is to serve as a panel of critics, and already following our first meeting, two of these scholars have submitted papers to us. I hope that some time in the next year we will be able to put together all of the papers presented by these scholars and share them with you.

Another effort we are initiating is to improve the career development, guidance, counseling, and placement system throughout the nation. We have a contract with the University of Missouri which will result in 50 state conferences on career development, counseling, guidance, and placement. I hope that you in industrial arts will try to be part of that effort.

Dr. Worthington is Associate Commissioner for Adult, Vocational, and Technical Education, U.S. Office of Education.

Comments on Career Education

Paul W. DeVore

Career Education! Who can be against it? Everyone seems to be for it. At least I thought so until I began to examine the question.

My task is to comment on career education. I speak this morning not as the president of the American Industrial Arts Association. I speak as Paul DeVore, a concerned citizen. I speak as Paul DeVore, a concerned parent. And I speak as a concerned educator. I am concerned about many things, but above all about the nature of our mentality which continues to misdirect our efforts and dissipate our energies away from the essential questions and assumptions about man, society, and technology.

Many educators seem to be accepting the mentality of the proponents of occupational, vocational, and career education and their perception of man as a worker; of society as a workshop; and of life as work. Not only is the meaning of man and his life restricted by these proponents, but they have begun to restrict the definition of work, a very honorable term until educators began to define it for their restricted purposes.

Sometime during the not-too-distant past, educational decisions were made either consciously or unconsciously about man, society, and technology. Behind each and every one of these decisions was a value based on certain assumptions about man and his society. Values, of course, occupy a critical place in decision making and in the creation of a society and an educational system. The question is: "What values and assumptions about man, society, and education enhance those elements which make each and every one of us more human, not less?"

There apparently is confusion as to the proper function of education in our society. A shift in direction has taken place. Emphasis is on the needs of society, not the individual. The purpose of education has shifted. The function is not to free man, but to enslave him; to prepare him for a career, a job, a place in the production—consumption cycle; to make him marketable. The present emphasis on job and career-centered education causes freedom to take on a hollow ring and education to lose meaning. Our values have, it seems, equated education with jobs and careers. One's life is measured in terms of one's job, and in the process it becomes less and less rewarding. The focus is on one goal, the economic goal. Man in the process becomes a marketable commodity, and his environment becomes a marketable resource. The result is the inevitable destruction of both, as the record clearly shows.

In other nations, with other forms of government, careers, jobs, and work are government policy. The emphasis is on the worker and his place in society, with the goal to enslave man for the good of the state, not free him. The question is one of values, as Kenneth J. Buck so aptly notes in the January, 1972, issue of the American School Board Journal: "Who exists for what? The individual for the system or the other way around?"

Looked at from this vantage point, career education becomes another in the long list of bureaucratic terms and phrases which divert our energies and efforts from the real mission—man as a human being controlling himself, his technology, and his society in the creation of a more humane existence. Rather than engage this question, educators are again asked to divert their energies toward career education. This is an open admission by educational bureaucrats that their promotions of the last ten years including vocational education revised, the world of work, occupational education, and salable skills just hasn't worked. Neither will career education, and for the same reasons. The placement of jobs and careers as the sine qua non of education in a democratic and technological society portends failure from the start.

The problem is not occupations, jobs, or careers. These are only symptoms, and career education treats the symptoms only, not the disease. Career education is a misplaced emphasis. The problem is change—technological change coupled with antiquated values. Career education, occupational education, and other proposals are committed to expending vast energies to cranking out industrial man—people tooled for survival in a system that will be dead long before they are. What the proponents of career and occupational training, with emphasis on work, fail to realize is that the only function of technology is the disemployment of human labor. The key to the system of career and occupational education is an absolute devotion to yesterday and the rejection of or contempt for "impractical school work." If one's education doesn't relate directly to a job or higher education, supposedly it is impractical and of no value. Everything must be utilitarian, practical.

I would submit this may be suitable for other societies, but not ours. Our society has been built by impractical men who placed more emphasis on theory and the future than on practice and the status quo.

Career education is a naive solution to a complex human and social question. At issue is the purpose and function of education. Those proposing career education focus on jobs, the labor market, salable skills, and marketable people. One might question the propriety of such an approach to education in terms of the future psychological well-being of our citizens. What happens when the entire education system focuses on careers, work, and jobs and the career or job for which one prepares ceases to exist? And what happens when the work that does exist is not psychologically rewarding? How does one answer the trauma of this situation?

Career education is a major misdirection of the economic and human resources of our country at a time when the issues are other than careers—when the issues are other than jobs per se. The issue is the determination of the kind of society best suited for all men; a society concerned with the full human development of all men. Today, the potential exists to create the most humane existence, the highest order of life ever, for more people than ever before, if we but focus on the education of man as a human being and not the education of man for work or a career. The highest order of human existence for the most people will come about through a high-level technological society, provided man focuses his attention on understanding and controlling for his benefit the technology he has created.

This means that education, if it is to serve man in gaining an understanding of life and living in a technological society, must not be a part of the work world but must be apart from it. Education must direct attention to providing man with the necessary perspective and the ability to engage in critical analysis, a vital element in making value judgments about the man, society, technology equation.

The question is not a matter of whether man will work or not. He will! Nor is the question one of whether man will be at some time, perhaps many times, trained and retrained for work. He will! The question is one of focus. It may be that the disenchantment and alienation of youth and society with education results not because the schools have not focused on work and careers, but because they have. The work and career ethos has permeated of late the argument for the very being of the schools. Those promoting occupational, vocational, and career education have focused on the rewards of education in the form of economic success and jobs. Man-working has been effectively separated from man-living. Education has become vocationalized and in so doing has lost its sense of mission for man, creating disenchantment and alienation in the process. The real questions about youth, in the process of becoming, have been lost sight of as members of the educational bureaucracy pursue their business—the business of staying in business.

May I recommend, for a perspective of career education in the future, you read "Capture the Flag" (Kahn and Wiener—The Year 2000, pp. 352-356).

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The Nature of Elementary School Education and Identification of Career Education Goals

Franklyn C. Ingram

In discussing the nature of elementary school education, we immediately are confronted by a dilemma. Are the elementary school grades kindergarten through six or one through six? What about the middle school? Does the middle school include grades five and six? Are five-year-olds in the elementary school? And what about ungraded schools? We see that a discussion of the elementary school offers some problems. There are, however, common considerations. I have chosen to divide the discussion into the WHY, WHAT, WHERE, WHO, and HOW of elementary school education.

First, the WHY. Why was the elementary school established? The elementary school was established to meet the needs of individual children and the needs of society. But what are those needs? The National Education Association listed the purposes of education in American Democracy. Although prepared in 1938, they are still accepted by most educators. The purposes were listed under four major headings: (1) the objectives of self-realization (personal growth and development of the individual); (2) objectives of human relationship (in the home, family, and community); (3) objectives of economic efficiency (occupational, personal, and consumer judgments), and (4) the objectives of civic responsibility (in and outside the local community). There is also a consensus of purposes which are stated in developmental terms. They include the development of skills, values, thinking, aesthetics, creativity, self-understanding, and health. Education should enable individuals to fulfill the unique, particular functions in life which it is in them to fulfill and fit them so far as it can for those common spheres which, as citizens and heirs of a joint culture, they may share with others.[9]

The WHAT of the elementary school program is found in the curriculum, defined as an organized series of learning opportunities designed to achieve desired goals. Curriculum has also been described as the totality of the child's experiences for which the school is responsible. There are several techniques of organizing the curriculum. Briefly, these include the separate-subjects model, the broad-fields model, and the activities-of-daily-living curriculum. The latter emphasizes the development of the child and takes into account his interests, abilities, and the environment, with all learning experiences related to problems of everyday living. The activity-oriented curriculum also emphasizes that learning is not a capacity, but an activity. It is on-going and provides opportunities for active involvement and first-hand experiences with real things. The curriculum should enable children to learn how to learn and to develop a passion for learning which will continue throughout life.

WHERE does the learning take place? It is important to recognize that, while the curriculum is the totality of learning experiences provided by the school, much learning takes place outside the formal classroom. However, there are several settings in which the majority of learning still takes place. First, there is the self-contained classroom: a single teacher with the major responsibility for a group of children who spend the larger part of the day with her. There is also the departmentalized classroom where several teachers share responsibility, with the day being divided into periods. Specialists in particular areas such as music, art, physical education, and more recently, science and math assist in the presentation of the curriculum offerings. The HUB is a relatively new concept which in the main requires a physical setting different from the traditional school building. The HUB contains the common elements including the library, resource center, audio-visual area, and laboratories housing specialized equipment for working with a variety of materials. Around the HUB are other learning centers and small individual study areas with teachers assisting in guiding children through a variety of learning experiences with common goals and objectives. Teachers with unique backgrounds provide instruction and guidance in specific areas.

WHO are the learners in the elementary school? How might they be described? First, it is evident that they come in a wide variety of sizes, shapes, interests, and abilities. They do, however, have some common characteristics which are important to our discussion. They have several natural instincts: the impulse for manipulative activity, the impulse to investigate, the art impulse, and the social impulse. All children have needs. These needs have been stated as developmental tasks by Havighurst. He emphasizes that at this level, the middle childhood years, success leads to happiness and success with later tasks. Failure here leads to unhappiness for the individual, disapproval by society, and difficulty with later tasks. Erickson states them a little differently, but his terminology is of particular interest. His fourth age, the ages of six through twelve, is called the Age of Accomplishment and Industry. It is essential, Erickson says, that each child be provided with opportunities for success. The child needs to overcome any feelings of inferiority and needs opportunities for success experiences before he can progress to later stages. During this period of his development, the child is also very industrious. He wants and needs to begin to feel comfortable with the "tools" of adult life and those he feels are related to his daily living and future responsibilities.

The WHEN to teaching is most difficult to state in specific terms. Obviously, the learning experiences should take place when it would properly meet the individual needs of the learner. Some teachers wish that the WHEN could be spelled out in specific terms with the content identified for each grade level or subject area. The elementary school program and techniques for providing learning experiences are as varied as the learners themselves, with the WHEN determined by the abilities and readiness of the learners. The learning should be learning that lasts, life-connected; it should be learning that has quality, concept-connected; and it should be learning for good living, value-connected.

HOW techniques should reflect the best we know about ways to foster the development of children. The subject matter is organized to further the stated objectives and purposes. Conditions to effect learning revolve around motivation and efforts to maintain interest. Several conditions are required: seeing a need or purpose in the learning situation, getting the meaning, making progress toward a recognized goal, and experiencing success. As stated by Bruner, "The first object of any act of learning is that it should serve us in the future." Young people need to be provided with experiences that may enable them to choose the best alternatives based on the long-term goals of man and his purpose on earth. You cannot teach a child what to think in preparation for the unknown. You can only teach him how to think so that he can face problems clearly and make valid decisions. He should not be content with what is, but with what should be.

Specifically, what are the objectives of career education and how are they related to the purposes and techniques of the elementary school? Career education in the elementary school revolves around an awareness of the career opportunities available in our society. The program concentrates on the importance and dignity of work, the concept that all work is meaningful, and that all who do a conscientious job contribute to the net benefit of all. Emphasis is also placed on the many rewards from work other than just money. It attacks the misconception that we repeat all too frequently, "all work and no play makes Jack a dull boy or Jane a dull girl." The implication is that play is fun and that work is not. Mager states it also when he says that we tend to confuse work with unpleasantness, but we sometimes fail to recognize that there are a lot of things that can be done while working, one of which is learning.

A warning issued in 1959 by John Hersey in a report to the Woodrow Wilson Foundation has relevance. His remarks were made in reference to the uproar following the Soviet Union's Sputnik and the concern of some for identification and development of scientists beginning in the elementary school.

> The ultimate danger in a crash program for talent is that a bureau or, worse, a calculating machine begins at some point to decide which able young person shall be a doctor, which a lawyer, which a beggarman, and which a thief.
>
> Every human being is unique and constantly changing. Every child can be said to have potential talent of some degree and kind. The value of each individual to a democratic society lies precisely in his uniqueness, and in the extent to which he chooses to use, and is helped to use, his special talent, great or small, for the common good.[11]

It is essential that any program proposed or instituted be an educational program rather than a training program. I assume we are discussing an educational program. It is important that industrial arts personnel exert their influence to preserve the educational nature of a program concerned with understandings related to our technological industrial society. We have said that such understandings are directly related to and are an integral part of our programs in industrial arts. Industrial arts has not operated in a vacuum. Industrial arts has assisted in the education of millions of young people and has been an integral part of the total educational environment. We must continue to assist at all levels.

Our influence is also needed to insure that the primary concern is with the individual and that he is provided with experiences and understandings that will enable him to control technology and not be controlled by it.

An educational program starts with a consideration of the child himself, his capacities, his needs, and his interests, all related to experiences which will foster his growth and organized around the problems and needs of society. The World of Work or Career Education program incorporates concepts that have traditionally been included in exemplary programs of elementary school industrial arts. Industrial arts has uniquely provided experiences which are varied and suited to meet individual needs and to provide success opportunities commensurate with individual abilities. Industrial arts also assists in overcoming a second misconception regarding the educational process. This is best expressed in a Charles Schultz cartoon in which Lucy says to her friend, "... try not to have a good time... this is supposed to be educational...."

Industrial arts of all curricular areas is unique! It provides activities to maintain interest and satisfy children's natural instincts to manipulate and investigate. It meets the children's needs as expressed by Havighurst and Erickson. It progresses from the familiar to the new, the simple to the more complex, and from the concrete to the more abstract.

Career education and the World of Work are included in industrial arts. Let us review some of the objectives of industrial arts for common elements. Bonser and Mossman expressed the elementary school program in these terms in 1924:

> A program that "...as a subject for educational purposes"...would be "...the study of the changes made by man in the forms of materials to increase their values and of the problems of life related to those changes".[1]

Research since that time has also shown the part that such learnings can have in overcoming the myth regarding the unpleasantness of the educational process. Several examples are cited including the work of Gunther at Teachers College, Columbia University, in 1931, and research conducted by Ingram at The Pennsylvania State University in 1966. Gertrude Noar, in FREEDOM TO LIVE AND LEARN, says that:

> Manipulative experiences...lead to explorations...for possible leads into needs and interests looking toward vocational developments....
>
> Certainly the rounding out of personalities by finding strengths to be capitalized and weaknesses to build up is a fascinating field of study for all people.[16]

Wilber stated the objectives in this manner. "Industrial arts is that phase of general education that deals with industry... its organization, materials, occupations, processes, and products, and with the problems resulting from the industrial and technological nature of society."[17] Elementary school industrial arts programs have included these elements. We need not fear a program in career education or the World of Work, at least not at the elementary school level.

There are numerous examples of how these objectives of industrial arts are implemented in the elementary school and integrated with the on-going curriculum. At the elementary school level, industrial arts goes beyond the concept of occupational information. It includes all the elements contained in Wilber's definition. It assists in providing a variety of experiences and opportunities to meet individual needs and provide learnings that may enable individuals to make wise decisions regarding their role in society and the adaptation of technology to better the lives of all citizens in a world community. Are we content, and do we want children to be content with what is, or with what should be?

It is obligatory that industrial arts continue to be an integral part of the total education program by providing a variety of experiences concerned with an understanding of the organization, occupations, processes, materials, products, and problems of our industrial society. If industrial arts does not take an active role in the current programs of career education and the World of Work, we really are not a part of general education.

At least at the elementary school level, we have a choice.

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Evolving Differences Between Middle Schools and Junior High Schools

Lowell D. Anderson

My purpose is to give you my understanding of a middle school. The last time I tackled this topic, it was by publishing an article in the journal. I felt the article was a fine one...that was until the state supervisor stopped by my office. His first comments were that it was a fine article, but no one in the field understands what you're trying to say. Would you please explain it? I'LL TRY TO BE MORE CLEAR AND EXPLICIT.

If we were to examine the topic, "What is the role of industrial arts in the middle school?" the essential question would have been passed over. The premise that industrial arts ought to exist would have already been established. The ensuing debate would embrace the axiological question, "Now that it already exists, what should industrial arts teach in the middle school?" The proposition that industrial arts ought to exist—or not exist—in the middle school is more than an academic question being posited by middle school advocates. A cursory examination of a large portion of the materials written on middle schools should rapidly dispel any notion which we hold that industrial arts exists in the middle school because it is right.

The question which we need to ask is, "Why should activities of an industrial arts nature exist in the middle school?" To fail to ask this question is seemingly another example of educators having defined and established answers which may fit the unasked question with only slight modification. In other words, surely the question can't be far behind if we already have the answer.

The theoretical problem which middle school advocates seem to debate is not the inclusion or exclusion of certain disciplines. That problem has already been resolved, but, "How can educators devise an environment which promotes the growth of the transescent child?" A solution to this problem, based on an examination of research, appears to be that one must examine the total system. In this case, how can one promote the growth of teachers, administrators, parents, and community to facilitate the maximum growth of students? To do this, it seems that new strategies must be devised to bring together "COMMUNITY" as a generic term, into a growth organizational pattern.

Examination of many middle schools, especially in the State of Maryland, leads me to conclude that a tremendous difference exists between the proposed theoretical model and the actual middle school. However, one cannot deny that significant differences are evolving between the emergent middle school and the traditional junior high school.

Seemingly, the critical area to which we must address ourselves in studying this problem is not the similarities but the differences. These differences are what I shall attempt to point out. They shall be headed under the following topical areas:

(1) The organizational format of the middle school as differing from that of the junior high school.
(2) The attempt to recognize and attend behavior characteristics of the transescent child in the middle school as differing from that of the junior high school.
(3) The role of the teacher in the middle school as differing from the role of the teacher in the junior high school.

A critical factor which all of us must face in considering the middle school is our approach. If we approach the middle school with the same curriculum models, facility planning procedures, administrative organizations, and student programing, we most likely will develop the same old junior high school. In other words, if we in industrial arts spend our time defining shop areas, equipping laboratories, teaching skills, defending information areas, and training teachers, we in all probability will not find a welcome place in the middle school.

ORGANIZATION

Let me return to the first of the three topical areas on differences between the middle school and the junior high school. The organizational form which is being developed for the middle school is different in some aspects from the organizational form of the junior high school. The first of these is:

> The middle school is attempting to organize itself to promote the child-centered program as differing from the discipline-centered program of the junior high school.

The middle school has attempted to organize itself on known characteristics of preadolescent, adolescent children. The teacher's purpose is to promote maximum growth of each child. The junior high school has developed an organizational form which is very comparable to that of the senior high school. Disciplines are the determinants of program organization, of department identification, and of teacher employment, assignment, and function. Extra-curricular activities are similar to those of the senior high school, emphasizing and modeling late adolescent behavior.

> The middle school is attempting to organize itself on the basis of function as differing from the line-command model of the junior high school.

The middle school is attempting to use internal motivation. Divisions of staff are based on function, having the flexibility to change as function changes without changing the total organizational structure. Results of this organization are a freeing from external control and an increased responsibility at the developmental level of the organization.

The organizational form of the junior high school is vertical-hierarchical, depending upon line-command and external motivation for its operation. Its form is comparable to any conventional industrial-business organization.

> The middle school is attempting to organize for maximum use of teacher expertise in an on-going process of curriculum development as differing from the externally-developed stabilized curriculum concept of the junior high school.

Middle schools are attempting to use pods with a group of teachers from different disciplines, operating as a team, for both planning and implementing a process-based curriculum.

The curriculum of the junior high school is dependent upon the development of curriculum guides and materials by persons of authority in the field, but frequently not in direct contact with students. This curriculum guide is given to teachers with the hope that it will be implemented.

> The middle school is attempting to organize itself to use community resources in the education of youth as differing from the junior high school's adherence to the school as being the important housing of education.

The middle school is attempting to individualize instruction which would promote the flexibility for students to research and explore outside of the school building. The critical result of this procedure is the transference of learning from being the responsibility of the teacher to being the responsibility of the student. The junior high school usually has a lock-step schedule, with teaching commonly emphasizing the importance of learning existing facts.

The middle school is attempting to provide an organization which would facilitate the growth of administrators, teachers, students, and community, differing from the junior high school which focuses on the education of the student.

A recent re-analysis of the data collected by the Coleman report appears to indicate that the prime factor in the educational achievement of the student is the parent. The second most important influencing factor is the teacher, and third, the peer group. Middle schools assume that teacher growth, administrator growth, and community growth will promote student growth; that assumption appears to be valid.

The junior high school's goal has been to focus on the student to promote his growth. Many times the prime hindrance to student development has been the organization which has attempted to assure his growth.

TRANSESCENT CHILD

My second area of concern is the attempt of the middle school to recognize and attend the problems of development and adjustment experienced by the preadolescent-adolescent child. Literature on middle schools commonly refers to this child as the "transescent" child... a child in rapid process of change.

These concerns are:

The middle school attempts to recognize and attend the very broad range of physiological differences of the transescent child, as differing from the junior high school which largely ignores these characteristics.

The organization of the middle school encompasses grades five through eight and was premised on the physiological development of children. There is a greater similarity between fifth and eighth graders than between sixth and ninth graders. The major reason for these differences is the onset of pubescence, with its correlated growth and intellectual development. The average age of menarche for both sexes in the United States is 12.8 years. Girls usually peak in growth rate at age 12, with boys peaking at age 14. Boys may continue to grow through age 18. Generally, the difference in developmental level between girls and boys is 2.5 years. A survey of twelve-year-olds at Farquhar Middle School found a height difference of 22 inches and a weight difference of 95 pounds.

The middle school attempts to recognize and attend the psychological characteristics of the transescent child as differing from the junior high school.

An examination of many studies on the transescent child continually turns up the same information: highly variable, extremely difficult to classify. Only one area seems to be consistent—children of this age will in all probability experience the greatest degree of trauma of self-realization, the greatest problem of searching for self, and the greatest need for acceptance, but still project the greatest amount of hostility and rejection. The critical element is to create an environment which can provide the necessary attention and support from peer groups and teachers.

The middle school attempts to recognize and attend the sociological needs of the transescent child as differing from the junior high school.

Even the most casual observer of the transescent child is aware of the power and importance of the peer group. The peer group both reinforces behavior modes which are acceptable and forces rejection of those behaviors which differ from group norms. It is a period of high physical activity commonly used to obtain necessary recognition. Sexual patterns are being formulated, with girls usually being two or more years more mature than boys. The group can be characterized as internally motivated and requiring immediate attention, as differing from much of education which is externally motivated and applicable to the distant future.

THE ROLE OF THE TEACHER

The last topic which I would like to present is the differences in role of the middle school teacher as compared to the junior high school teacher. These are:

> The middle school attempts to view the teacher as the key to a process-oriented curriculum, and only through the continued development of the teacher will the curriculum develop, as differing from that of the junior high school.

A child-centered curriculum depends upon the creative abilities of the teacher to work harmoniously in diagnosing and prescribing solutions to identified problems. Middle school teachers must function in cross-discipline teams, planning, interacting, and developing a process curriculum. Junior high school teachers commonly need not consult with any members of a school faculty in determining curriculum.

> The middle school attempts to view the teacher as a facilitator of learning as differing from the preachment role of the junior high school teacher.

The middle school attempts to change the role of the teacher from being a disseminator of knowledge to a person who can work with the transescent child in solving evolving problems. The effective facilitator is the teacher who can change the focal point of motivation from the teacher to that of the student. The common role of the junior high school teacher has been to teach skills, knowledge, and assure conformity of behavior patterns.

> The middle school attempts to identify the teacher as possessing specialized skills and knowledge, as differing from the junior high school teacher who is frequently frustrated in attempting to achieve the goals of a discipline of knowledge.

The task of preparing middle school teachers has largely been assumed by the school system, primarily as in-service education. Few universities or colleges are involved in preparation of teachers for either the middle school or the junior high school. The typical program prepares teachers for either elementary or secondary teaching. Most teachers thus prepared are extremely gratified to be promoted to the senior high school.

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Identification of the Role for Industrial Arts in Career Preparation in the High School

James E. Good

The concept of career education will have a profound impact upon our total educational system. It will enable us to capitalize upon all of the ideas and successful approaches to the learning process and eliminate those aspects that have been detrimental.

If career education is allowed to be implemented in its purest form, it will provide a lifelong learning process (K-life) that will include learning about the world we live in, its people, the social and physical environment, learning about the sciences, arts, and literature we have inherited and are creating, and learning about the way in which the world's people are interacting.

In short, an effective career education program will better equip individuals to live their lives as fulfilled human beings.

My assignment is to focus upon career education at the secondary level, with emphasis on the implications for industrial arts education.

In order to put this task in proper perspective, I would like to review briefly the over-all goals of career education as well as the specific objectives at the elementary and junior high or middle school level.

GOAL 1: To make all educational subject matter more meaningful and relevant to the individual through restructuring and focusing it around a career development theme.

Inherent in the basic purpose of education to prepare the young to live a productive and rewarding life is a priority need to have a command of the basic skills of reading, writing, arithmetic, and problem solving. Implied in this goal is the need to:

a. Assess the basic skills in performance terms that are essential to whatever career goal or lifestyle a person chooses to pursue.
b. Eliminate the teaching of each subject discipline in an abstract isolated vein with the lack of relevance, practical application, and motivation.
c. Focus the basic subject areas around a student-elected career development theme that will capitalize on the interests and motivations of the student, thus enabling him to improve his competency in the basic skills as he is pursuing a potential career goal.

GOAL 2: To provide all persons the guidance, counseling, and instruction needed to develop their self-awareness and self-direction; to expand their occupational awareness and aspirations: and to develop appropriate attitudes about the personal and social significance of work.

Rather than blame the guidance department for inadequacies in scheduling and student course selection or lack of occupational information, personnel, through career education, enable guidance to:

1. become an integral part of the total system and a responsible member of the total staff and community.
2. provide the opportunity for maximum use of people who have essential training in guidance and counseling to become involved in the educational process as part of an educational team assisting students to find their individual identity and make responsible decisions.
3. become accountable for specific guidance functions at each student decision-making level.
4. serve as a catalyst for community involvement in the total educational process to ensure student exposure to all elements of the employment community.

GOAL 3: To assure the opportunity for all persons to gain an entry-level marketable skill prior to their leaving school.

Currently, there are approximately 2.5 million students leaving our education system annually who are not adequately prepared for a career.

Inherent in the career education process is the opportunity for a student to develop the simplest to the most complex marketable skill, depending on individual interest, desire, and capability. In addition, it is possible to develop a wide variety of low-level skills in one or more occupational clusters by placing individual priorities on a breadth approach to the world of work or to develop the most complex of specialized skills within a specific job family if he chooses during his advanced high school years.

GOAL 4: To prepare all persons completing secondary school with the knowledge and skills necessary to pursue further education or to become employed.

Whether we care to admit it or not, our educational system has developed into a dichotomy that has channeled our students into one of three tracks, especially at the secondary level. The gifted 40% are given the privilege of entering a college preparatory program and spared the evils of enrolling in practical-type courses. Others, approximately 12%, not so lucky, are bussed off to a vocational school for half a day to learn a skill and then returned to the school for the remainder of the time to complete courses that are most likely totally unrelated to their vocational pursuits.

For the remaining portion of the student body, there seems to be no clearly-defined goal. These are the average or below-average students considered incapable of entering college who have not elected to enter a specific vocational training program. These students are frequently "turned off" by an educational system which typically enrolls them in study halls or courses that prepare them for absolutely nothing. These students are potential drop-outs from an irrelevant program which considers neither their present needs nor their future goals.

In essence, career education will:

1. eliminate this tracking system.
2. put priorities on the basic fundamental skills which are essential for all students, regardless of ultimate career or higher education aspirations.
3. provide opportunities for the students to develop the necessary knowledge and skills for immediate entry into the labor market or pursuit of a higher-education degree.
4. provide a more responsive system in meeting individual needs, desires, and capabilities by increasing student options to enroll in cooperative education programs, or complete vocational and academic courses based on continuous progress, develop basic competencies by pursuing individual topics of interest, and elect special-interest courses designed specifically for job preparation or entry into further education.

GOAL 5: To provide services for placing every person in the next step in his development, whether it be employment or further education.

Regardless of when a student elects to leave the system, placement assistance will be provided, whether it be immediate job placement or entry into a post-high school program.

GOAL 6: To build into the educational system greater utilization and coordination of all community resources.

In order for the goal to become a reality:

1. duplication of staff and training facilities must be avoided wherever possible.
2. the educational options must be viewed on a community or regional basis.
3. resource people must be identified and classified as to their most effective level and area of contribution integrated into the system as such.
4. school-employer relationships must be developed on a partnership basis to ensure joint use of training staff and facilities.
5. the curriculum and specialized training options must be responsive to individual, as well as community needs.
6. new options must be explored in the length of the school day, transportation services, school and labor restrictions, differentiated staffing, certification, and curriculum development.

GOAL 7: To increase the educational and occupational options available to all persons through a flexible system which facilitates entrance and re-entry either into the world of work or the educational system.

The present concept of terminating formal education at a particular age, or even a particular achievement level, seems totally unrealistic in a world of rapid technological change. "Formal" education must be made flexible enough to permit entry, exit, and re-entry throughout an individual's lifetime to permit learning and growth to continue as the need arises while still meeting basic requirements for graduation or completion of prescribed curriculum on an individualized basis. "Formal" education will never be finished as we now know it. Options for day or evening school, correspondence courses, or special educational media programs should be open to all persons of all ages as they desire it.

Students entering high school who have been exposed to a comprehensive career education program will demonstrate a greater degree of maturity because they have been exposed to and involved in a broad range of activities and experiences related to the world of work and our technological society and have participated in the decision-making process at each level.

At the K-6 level, student experiences presumably have evolved around activities related to the 15 occupational clusters, with emphasis on developing pupil and occupational awareness and improving over-all individual performance by unifying and focusing the basic subject around each cluster.

Within the framework of each cluster, students should gain insights into what the occupations look, sound, and smell like, who works in these occupations, the lifestyle of the people in these occupations, with whom the people work, where the jobs are, and how the tasks are accomplished.

Using a multi-active approach involving a wide variety of materials, resource people, and outside experience, students leaving the elementary grades should have developed a positive attitude about the personal and social significance of work and become more aware of their own abilities, interests, and aptitudes in relation to various occupations.

The junior high or middle school level will provide the first formal setting for orientation experiences that will further assist students to evaluate their interests, abilities, values, and needs as they relate to occupational goals for specific career clusters.

The ultimate career education concept would completely reorganize this level into blocks related to each of the 15 clusters. Each block would last approximately one semester in length, and the basic subjects would be integrated into each cluster. Many school districts have already committed themselves to the core, school within a school concept, but have had difficulty integrating the so-called special areas, i.e., industrial arts, art, music, business education, home economics, and physical education into the program. Career education would make it possible to integrate all of the subject areas. The student at this level would be able to select the clusters and would not necessarily be required then to complete all 15. Once again, a variety of activities and resources would be used as motivation to increase student interest.

By the time a student reaches the senior high, he should have a better command of the basic fundamental skills because he has been given the opportunity to develop them while engaging in activities that were meaningful and pertinent to him. In addition, his exposure to a wide variety of career opportunities has provided him with a basis upon which to formulate tentative decisions concerning career clusters he would like to explore in greater depth.

Two distinct phases of career decision-making emerge at the secondary level. The first is the exploration or beginning in-depth specialization level in which a student selects the cluster or clusters he wishes to pursue in greater depth. The second is the level of specialization in which the student may elect to specialize within a specific cluster or take additional courses that may better prepare him for entry into a post-high school program.

Regardless of the sequence or variety of secondary experiences, a student leaving the system should be prepared to exercise the following three options:

1. enter the labor force with a marketable skill.
2. be accepted in a post-high school technical training program.
3. pursue a career in a higher-education program that will lead to a four-year degree.

In addition, the secondary system must be flexible enough to enable a student or adult to leave or re-enter the system at any time. The rate at which change is taking place in our technological society makes it imperative that we prepare ourselves for a lifelong learning process of training and re-training. The implication and opportunities for industrial arts are almost unlimited if we are willing to become an integral part of the entire process and be held accountable as such.

Our identity within the general educational system has made us partly responsible for the trivial and unrelated material given the 2.5 million students who leave the formal educational system every year without adequate preparation to pursue a career. We can and must contribute to the development of certain levels of marketable skills and not attempt to make a clear distinction between "general" and "vocational" experiences.

Students leaving the system not prepared to provide the basic essentials of food, clothing, and shelter for themselves and others who depend upon them will become an ever-increasing burden on society, and their survival will depend on those who can provide these essentials as well as contribute to welfare and manpower programs. Education can and must prepare each individual to be self-sustaining and prevent perpetrating the inequities of vast numbers of individuals totally dependent upon others because of a lack of salable skills.

In analyzing the 15 occupational clusters of agri-business and natural resources, arts and humanities, business and office, communications and media, construction, consumer and homemaking, environmental control, health, hospitality and recreation, manufacturing, marine science, marketing and distribution, personal services, public services, and transportation, there is no doubt that industrial arts can make some contribution to each cluster. However, during the transition into a responsive career education program and based on its current realm of responsibility, it appears that the most direct leadership will occur in the clusters of communications and media, construction, manufacturing, and transportation.

Industrial arts teachers should not be responsible for the total content and experiences within the clusters because the high degree of specialization options extends far beyond the area of industrial arts expertise.

However, to be truly effective, it is imperative that all staff responsible for the education of the students who have selected a particular career cluster work together in the joint planning and development of curriculum and experiences related to the students' pursuit of an identified career goal.

The example of transportation can be used for purposes of clarification. At the junior high level, the body of content would evolve around the major areas of land, aerospace, pipeline, and water transportation, keeping in mind the orientation aspect that would broaden a student's understanding of the social, economic, and practical aspects of the field.

At the beginning in-depth or exploration level in the senior high, the content and activity emphasis would evolve around such topics as local and suburban transit; highway and rail transportation within land transportation; commercial, general, and spacecraft aviation within aerospace; liquid, gas, and solid transmission within the pipeline category; and inland and oceanwater transportation in the realm of water transportation.

The objectives at this level include:

1. providing in-depth exploration and training leading to an entry-level skill in one occupational area and providing a foundation for further progress, leaving open the option to move between clusters, if desired.
2. improving student performance in the basic subject areas by making the subject matter more meaningful and relevant through unifying and focusing it around a career development theme.
3. provide the essential guidance and counseling that will assist students to select an occupational speciality at the specialization level.

The specialization level is designed for the student who has elected to pursue a specific career into intensive preparation for a specific occupation or advanced studies for preparation for further studies.

The decision to move into this realm rests with the student. He may elect to explore other clusters and remain at the exploration level.

Using transportation as the focal point, a student entering this level may elect the specific category of highway transportation. For example, the body of content in this realm would consist of such categories as vehicle operation, security and inspection, freight handlers, dispatching systems, equipment maintenance and repairs, structures maintenance and repair, and estimating costs. Once again, the basic subjects would evolve around these topics. It is also conceivable that the role of the transportation teacher would be to begin teaming up with the related vocational teacher to assist in making a smooth transition in appropriate satellite training facilities to provide more advanced skill training.

It is expected that the role of the transportation teacher would be more of a manager at this stage, with the key responsibility for insuring that the students receive the necessary observation and training experiences in accord with their career goal.

Carrying the specialization option to the fullest extent, a student may elect to remain within the realm of highway transportation and specialize in the area of equipment maintenance and repairs, or he may elect to move into another realm such as the subcategories of automotive or busses, trucks, and trailers. At this level of specialization, the student should be mature enough to accept highly intensified training in preparation for placement into the career option of his choice.

It is obvious that career education will not be implemented overnight, and there will be many school districts that will not be directly involved in the models or be able to obtain first-hand assistance in making the transition. However, it becomes increasingly apparent that the educational process will move in this direction and, therefore, it is essential for each industrial arts teacher to find his own identity within this total concept.

While the industrial arts teacher cannot assume the full responsibility for implementing career education, he must broaden his horizons and become involved in activities that will assist him in developing a total perspective of education and the world of work.

The following areas of involvement would seem most appropriate at this stage:

1. Become involved in the development of state, regional, and local planning of immediate and long-range career education programs.
2. Begin joint planning on an equal basis with the entire faculty in an attempt to better understand the objectives and assessment in all areas of the school curriculum.
3. Become better acquainted with the industrial community by becoming acquainted with the personnel, directors, plant managers, supervisors, and employees of the local plants and companies who are potential employers in the fields of the related technologies.
4. Become better acquainted with professional literature and materials related to the industrial technologies. There is a vast and virtually untapped source of information available to energetic teachers who are willing to do a little research and contacting of individual industries.
5. Expand the resource base for student experiences by developing a plan of action insuring student involvement in observation cycles, tours, and cooperative education programs for the purpose of expanding their horizons and broadening their understanding of our technological culture.
6. Assist in the planning and developing of meaningful continuing education programs, thus becoming known in the community and increasing individual awareness of community needs and feelings.

Career education only enhances the goals and ojectives always established for industrial arts. Therefore, the opportunity has never been greater for industrial arts to establish its identity and emerge as a leader in the educational system.

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Development of Career Education Goals for Teacher Education Programs

James R. Heggen

Approximately 18 months ago, John Geil and I became involved in an elementary career education project in the State of Florida. Ever since that time I have been eagerly learning and hearing about the many ramifications of a total career education program. When Dr. Ralph Steeb, our state industrial arts consultant, informed me that at least a day and a half was going to be devoted to career education at the Dallas convention, I became highly enthused about the many marvelous things that I would have the opportunity to learn.

During the past two months, I have constantly been inquiring about the over-all program. One of the early presenters identified was Dr. Worthington, while the rest of the program remained a complete mystery. It wasn't until about two weeks ago that I became informed of the total career program. I, like you, received the newsletter explaining the workshops and the participants. Eagerly I began to read about each of them in detail. Suddenly, my heart jumped; there listed as a presenter was a name quite familiar to me. Not wanting to panic and have a coronary attack, I slowly reached for my phone to call my good friend Ralph Steeb. Quietly I inquired, What in the H---'s going on at the national level. Patiently Ralph calmed my nerves and then suggested that I had better begin to work on my presentation.

The following Friday I received a very nice letter from our man in Washington, Dr. Kabakjian. He was thanking me for my acceptance of this assignment. So as you can see, before you stands a volunteer.

The major task that was given to me for the workshop was to develop the goals for building a career emphasis into a teacher education program. Before we can begin to investigate this task, we must start from one basic assumption. We must assume that career education is not a passing fancy of this administration or the commissioner, but rather that it will remain a top priority in education for years to come. This premise is extremely important to us, because it gives our discipline the necessary emphasis to discuss strategy with the other programs.

Basically, I see three major aims that the industrial arts field should consider if we are to be successful in a career education program.

First, we must commit ourselves at both a national and state level. We must wholeheartedly assume a responsibility in the total education of youngsters in becoming better and more productive citizens. In order to accomplish this, each state will have to enact legislation that will allow equal status between the existing program and career education. The passage of new legislation will undoubtedly mean new directions for the state associations. Therefore, they will have to commit themselves to a total career program, one that begins in grade K and continues on through the adult years.

Secondly, a career education program must be practical, realistic and interesting to both the practitioner and the learner. It also must be relevant to society and the parents, in that it is meeting the needs and desires of each. Today, people are not going to become very excited about a program that is based on yesterday's world of work or geared to a small segment of our society. They are looking for answers to questions, some of which have not yet been asked. We will also have to establish a system to measure the cause and effect of such a program as it develops over the years. We must continually be looking toward the future and modifying our curriculum to meet new challenges.

Thirdly, teacher educators will have to change their attitudes about the world of work curriculum and its place in the university structure. More especially, industrial arts educators will have to come in out of the shop and begin to work in a more compatible way with the other disciplines. We can no longer afford the luxury of remaining by ourselves in a semi-isolated manner. Of course, we still will have as a prime responsibility the training of teachers directly for our field, but we must integrate our position to meet new horizons. I also recognize that in some situations it will be extremely difficult to fuse our ideas into a curriculum that is primarily liberal arts, but we must.

Directly related to the problem that we are going to have in many of our on-campus programs is one that may be our greatest salvation. The in-service work that is needed in the field of education is extremely great. The total number of teachers requiring our services is astronomical. However, they are a ready audience and are usually quite eager to adopt new curriculum ideas that can help them become better teachers. I have found them to be exceedingly interested in a career program, and they can instill a lot of pressure directly on the universities. This peer pressure has done more to advance our career project than can perhaps ever be measured. As a matter of fact, they are beginning to make things happen almost too fast for us.

So far, from our limited experiences, we have discovered that a career education program is different from our traditional programs. There are many facts to consider when planning the program. The following list is but a composite of the many ideas that one should be cognizant about when planning.

1. It must be totally integrated with other curricular areas in the education system.
2. Re-training of teachers is a necessity if the program is to function properly.
3. The development of tool skills is essential for all teachers in the program.
4. Activities must be planned to closely replicate the real world of work.
5. It takes a great deal of human compassion to work closely together at all levels of education.
6. The learners who have participated in explorations of careers have been most enthusiastic and interested.

If we can accomplish these goals within the next few years, we will have made a major contribution toward the continued success of industrial arts education. Students, teachers, parents, and other groups are all watching the development of the career education program. If we, as leaders in education, stand back to observe this happening and fail to get into the mainstream, we may have lost a golden opportunity for industrial arts.

Dr. Heggen is Co-Director of Project LOOM and Assistant Professor of Industrial Arts at Florida State University.

Comprehensive Career Education— Model #1 (School-Based)

E. Keith Blankenbaker

Comprehensive Career Education Model I (CCEM) is the school-based component of a total career education program which also includes a home-community-based model, a residential-based model, and an employer-based model.

The school-based CCEM is an experimental program which purposes to revitalize education by infusing career education themes into the existing curriculum. Because attitudes and skills begin to develop at an early age and are modified over time, the model encompasses grades K-12. The model is characterized by extensive community, industrial, and business involvement; it makes use of cooperative education and stresses placement of departing students either in jobs or higher education programs.

The purpose of this paper is to briefly review the development of CCEM, discuss its present status, and identify the relationship of industrial arts to CCEM.

DEVELOPMENT OF CCEM

Organizing and Funding

The genesis of Comprehensive Career Education can be traced to many sources. In consideration for the time allotted, this presentation will consider only the events of recent months. Dr. Sidney P. Marland, U.S. Commissioner of Education, must be identified as the public figure on the national scene who has been most instrumental in launching the research and development which is now underway. In an address given in May of 1971, Dr. Marland discussed some of the problems our school systems are facing. Principally, he directed his comments to the three-track structure of many school systems (academic, general, and vocational) and singled out the general curriculum for criticism in saying:

> The general curriculum, for those of you not familiar with it, is a fallacious compromise between the true academic liberal arts and the true vocational offerings. It is made up, as its name suggests, of generalized courses, possessing neither the practicality and reality of vocational courses nor the quality of college-preparatory offerings. Watered-down mathematics, non-specific science, "easier" English—such is the bland diet offered in the name of the general curriculum—not much to chew on, not much to swallow.
>
> We normally think of discrimination as an illegal separating-out process based upon racial and ethnic considerations. I regard the general curriculum as just as discriminatory and just as outrageous.[1]

The speech in which the above remarks were made served to announce the USOE's intent to pursue the development of career education.

During the same month, the Center for Vocational and Technical Education (CVTE) at The Ohio State University submitted a proposal for the role of project manager of the school-based model. Objectives of the project were developed to test and install a comprehensive career education system by infusing career education objectives into the existing educational program.

On June 15, 1971, a $2 million grant was awarded to the CVTE for the development phase of the school-based Comprehensive Career Education Model (CCEM) through March 15, 1972. Because of a decision to expand the number of schools (Local Education Agencies) which would be involved in the project and because it was found that treatment units were not readily available in a usable form, a supplementary contract was awarded.[2]

Following the awarding of the CCEM grant to the CVTE on June 15, a project director was appointed and recruitment of staff was initiated. A nucleus of CVTE/CCEM (Comprehensive Career Education Model 1 staff at the Center for Vocational and Technical Education) staff and several consultants held the first project-planning conference at the CVTE on July 6-7. Discussion centered around a "capstone" effort which would identify, examine, and evaluate existing career education materials and modify them to fit the model.

Several areas of basic agreement about the Career Education Model emerged from this conference, including the requirements that the CCEM must provide opportunities for

100% placement of all students; be flexible enough to constantly provide options for the student: supply the student with realistic occupational information: improve student performance in basic subjects built around an occupational theme: develop a transportable model which overcomes regional and local differences; provide for both formative (continuing) and summative (final) evaluation; include a search, acquisition, redesigning, testing, and revision process in order to capitalize on existing materials; provide a schematic for building on existing programs with a mechanism for identifying gaps and a procedure for closing them: and suggest strategies for incorporating career education in the school curriculum.[3]

One recurring emphasis in the conference was focused on career education as a developmental, cumulative process, parallelling the grade-by-grade growth of the child.

MATRIX DEVELOPMENT

During July and August, the CVTE/CCEM staff extensively reviewed existing material to identify distinctive parts or "elements" of career education. The eight elements of the initial CCEM Matrix were identified in mid-July, 1971. They were: Career Awareness, Self Awareness, Appreciations and Attitudes, Decision-Making Skills, Economic Awareness, Skill Awareness and Beginning Competence, Employability Skills, and Educational Awareness. These basic educational areas can be developed instructionally to assist students in achieving a sense of career identity. When placed graphically against the 13 grade levels, K-12, the eight elements constitute a Matrix (Figure 1) with 104 blocks or "cells" (8 elements x 13 grades) that can be filled with specific sets of appropriate learning experiences.

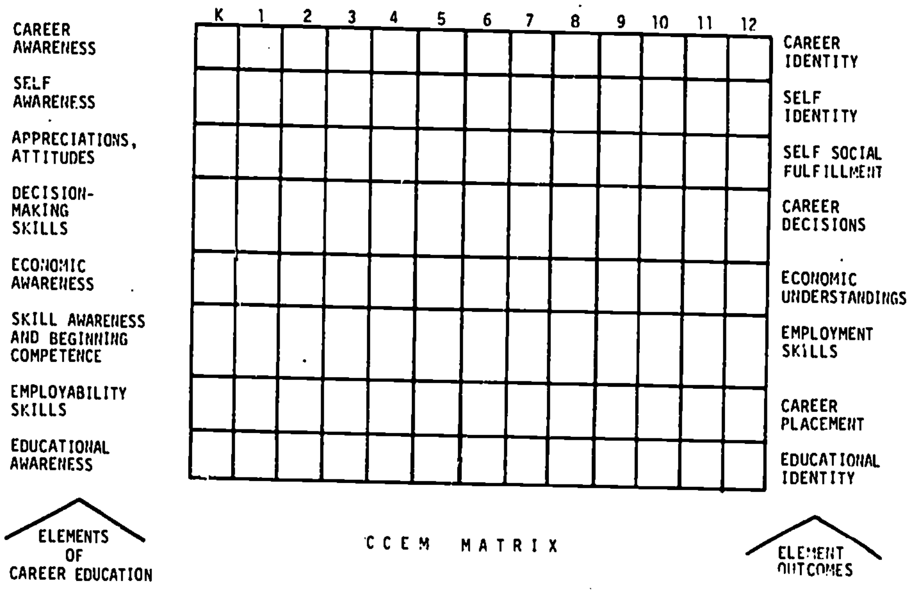

Figure 1

Two new concepts evolved during the development of this initial Matrix: the hypothesis that the eight elements represent a complete picture of what should be infused into contemporary education to achieve career education, and the theory that mastery of these elements can best be attained through a cumulative, grade-by-grade sequencing of learning experiences within each element. During July and August, the CVTE/CCEM staff drafted suggested developmental goals and strategies at each grade level.

ELEMENTS OF CAREER EDUCATION

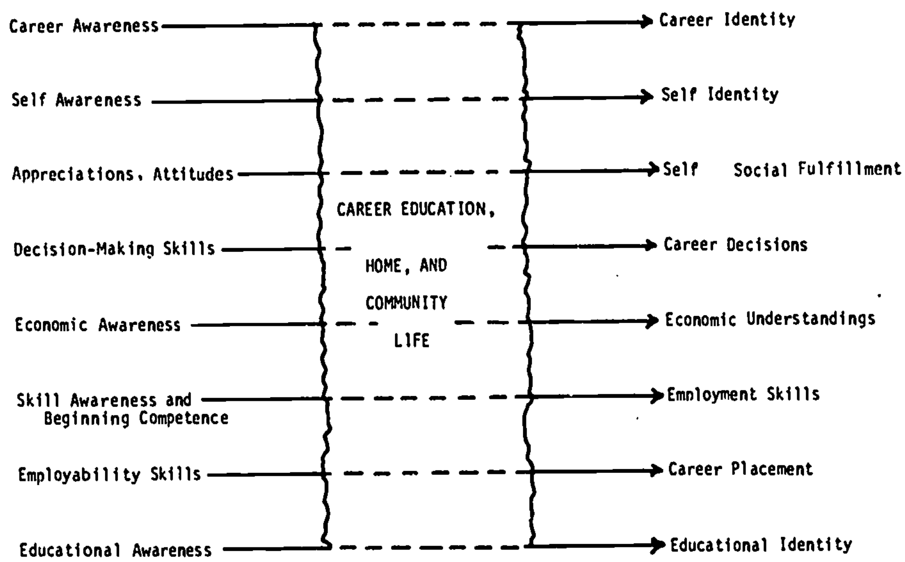

Figure 2

Later, the Matrix terminal "outcomes" or realistic learning goals for each element were identified. The Matrix outcomes (Figure 2) which are designed to equip the student with entry-level job skills or prepare him for further academic or vocational training are: Career Identity; Self Identity; Self-Social Fulfillment; Career Decisions; Economic Understandings; Employment Skills; Career Placement; and Educational Identity.

Translating these outcomes into specific goal statements and performance objectives required the combined efforts of the CVTE/CCEM staff, LEA teachers, curriculum experts, and experienced administrators. As a result of this effort, the eight elements were subdivided into 32 themes. After completing this step, goal statements and performance objectives were written for each of the element themes. The completed set of papers for each of the 32 themes constituted the "operational" version of the Matrix which contains 416 cells (32 themes x 13 grade levels). Each cell called for a specific set of learning experiences needed at each grade level in the appropriate element and theme areas. The Matrix cells represent a workable basis for organizing new learning increments for career education.

In its present state of development, the "operational" Matrix is not to be construed as "ideal" or complete. Further refinement is expected as the Matrix is used in each LEA to identify and refine treatment units for use in delivering comprehensive career education at each grade level.

LEA Selection

Having engaged in an extensive effort to identify urban and semi-urban school systems which had previously shown interest in and attempted to implement career education curriculum materials, 13 school districts were invited to submit proposals which outlined the extent to which they could become involved in CCEM. Only urban and semi-urban schools were considered because they possessed the components necessary to test a transferable program.

On August 9, USOE completed its review of these proposals and selected the following six sites: Atlanta, Georgia; Hackensack, New Jersey; Jefferson County, Colorado; Los Angeles, California; Mesa, Arizona; and Pontiac, Michigan.

Curriculum Materials

A national search was conducted by Palo Alto Educational Systems Inc. (PAES) for the purpose of identifying and retrieving "on-shelf" treatment units which could be used to deliver the career education objectives identified in the Matrix. Simultaneously, the LEAs were asked to identify the treatment units that were available within their respective school systems which could deliver career education.

Of the 915 in-place and on-shelf units which passed the original screening and were shipped to CCEM headquarters, 140 were selected for modification and pilot testing.

Contrary to the original "capstone" conception of the task of delivering career education through Model 1, it was found that none of these treatment units were developed well enough to permit them to be transported to other schools and installed in such a manner as to provide reasonable assurance that career education objectives would be realized. Therefore, a handbook for developers is being prepared which will serve as a reference for the revision of these materials.

The revision and pilot testing of approximately 40 units is expected to be completed before installation in September 1972.

Support Systems

In an effort to relieve school guidance counselors of the data collection task required to maintain the Guidance and Placement Program, a Support Systems group was organized. By mid-February, the Support Systems group had developed a Career Information System model and started developing a Placement Information System.

Methodology of CCEM

Two factors make CCEM unique—the application of engineering methodology to an educational research and development project and the concept of infusing career education into the existing K-12 school program.

A modified form of PERT (Program Evaluation and Review Technique) is being used to plan, organize, and control CCEM. The utilization of this engineering tool is essential because of the necessity of directing the efforts of many people to accomplish many different tasks almost simultaneously.

The concept of infusion means that all subject matter areas in the school program will be involved in delivering career education.

RELATIONSHIP OF INDUSTRIAL ARTS TO CCEM

The concept of infusion should serve as a basis for answering one of the questions to which I was asked to speak—What is the relationship of career education to industrial arts?

In the participating LEAs, industrial arts teachers, like all other subject area teachers, will be pilot testing career education treatment units which are related to their subject matter area. In fact, the contracts that the LEAs have signed or will sign specify the grade level and subject matter areas in which the materials will be pilot tested. This means that CCEM <u>is not</u> seeking to replace any subject matter area. The purpose is to provide viable, relevant content which taken in total will result in each student attaining the terminal goals of Career Identity; Self Identity; Self-Social Fulfillment; Career Decisions; Economic Understanding; Employment Skills; Career Placement; and Educational Identity. Ultimately, this will mean the identification of career education content which is appropriate to infuse into industrial arts at all grade levels.

Industrial arts teachers in the LEAs, like all other teachers, will have the opportunity to help modify the curriculum materials which are tested. They will also be involved in an in-service teacher education program which will help them improve their teaching skills.

For teachers in other school districts, CCEM will culminate in transportable treatment units which have been tested and have proven their value for delivering career education objectives. After the treatment units have been tested, they will be available for adoption by any school district.

FOOTNOTES

(1) S. P. Marland, Jr. "Education for the Real World," Address presented at the Twelfth Annual Banquet of the Jefferson County Chamber of Commerce, Hilltop House, Harper's Ferry, West Virginia, Wednesday, May 26, 1971.

(2) The Center for Vocational Technical Education, "Interim Report—A Comprehensive Career Education Model," U.S. Department of Health, Education, and Welfare, March 2, 1972.
(3) The Center for Vocational Technical Education, "Monthly Report—A Comprehensive Career Education Model," U.S. Department of Health, Education, and Welfare, December 31, 1971.

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The Interdependence of Industrial Arts with Career Education Within the Maryland Program

Walter Mietus

Just two years ago President Nixon made a public call for educational reform, and several months later Commissioner S. P. Marland responded with a plan for career education which he describes as a revolutionary concept, "a new order of education concerned with the usefulness and self-realization of every individual."* Our reaction to his model or plan, as industrial arts educators, might be that "he re-invented the wheel" or that he is championing a cause which leaders of industrial arts professed for decades. Logically then, what is revolutionary? What elements form the major thrust for educational reform? Answers to these questions will be provided by describing the Maryland Career Education Program in action.

After preliminary studies were made, the Maryland State Department of Vocational Education established the need for career education and initiated steps to obtain federal support. A proposal was drawn to meet the requirements of the Exemplary Programs described in the BAVTE Policy Paper No. AVL-V70-1.

In order to receive federal support, the four stipulated requirements were that a project must make:

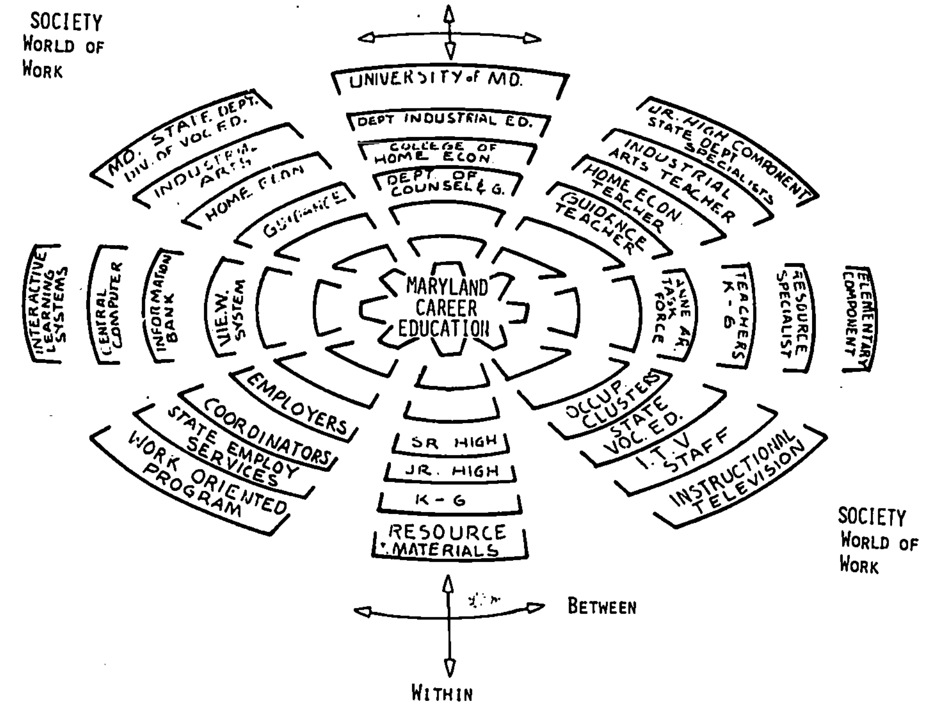
1. Provisions for broad occupational orientation at the elementary and secondary school levels so as to increase student awareness of the range of options open to them (students) in the world of work.
2. Provisions for work experience, cooperative education, and similar programs, making possible a wide variety of offerings in many occupational areas.
3. Provisions for students not previously enrolled in vocational programs to receive specific training in job entry skills prior to the time that they leave school. (Some of these training programs might be very intensive and of short duration.) To help students develop and use the career decision-making process more effectively.
4. Provisions to help individuals make smoother transitions at key points during their career-life, such as the transition from school to further training or to work.

Faced with the charge of developing a plan which would incorporate the above objectives and the task of implementing a strategy of action for reform and revolution, the Maryland State Department evolved the interdisciplinary approach to career education. Figure I is a graphic synthesis which, according to my perception, represents the program as it functioned in the first year. The figure is meant to communicate the concerted effort of agencies which ordinarily function separately and which make a cumulative input into the program. Initially, tacit and explicit contracts were made with the agencies or components depicted. Hierarchical authority relationships were kept to a minimum, and responsibility was shared rather than completely delegated. The process input flows along the octonary axis as well as oblongitudinal paths of the ellipse. The boundary lines of each component are open. Within and between interaction communications are promoted. The common denominator or the thread interweaving all components is career

*U.S. Government Printing Office, Superintendent of Documents, Catalog No. HE 5280 80075, Washington, D.C. 1971.

FIGURE I

CONCERTED INTERACTIONS OF COMPONENTS OF MARYLAND CAREER EDUCATION PROJECT



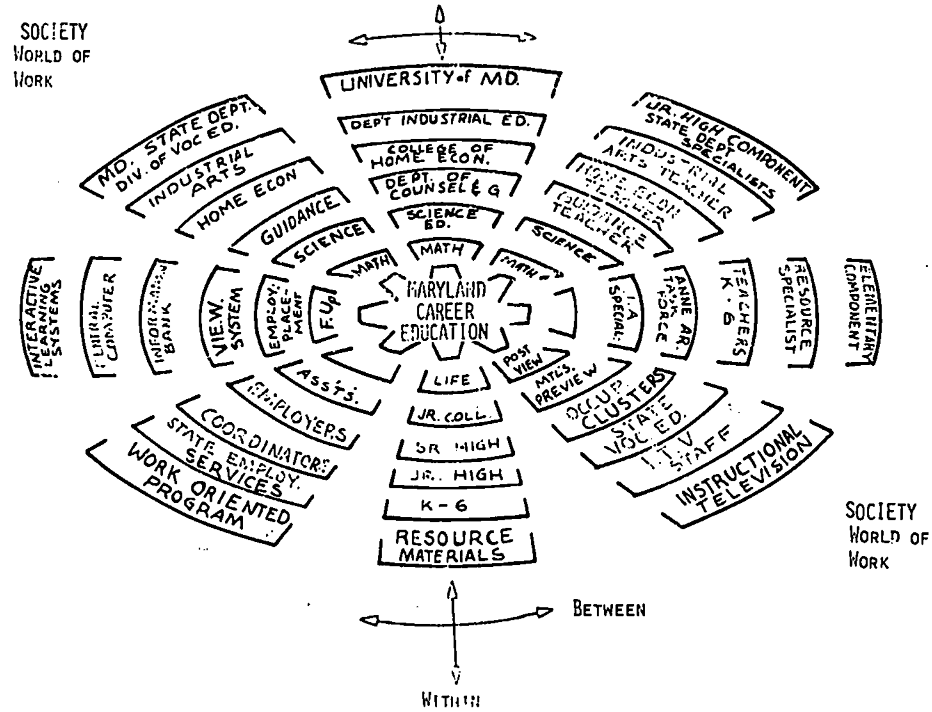
education. It was designed on a continuum proceeding from awareness of self, career awareness, career exploration, and decision making. The progression of activities was designed to include nine occupational clusters, with a consideration of experiences appropriate for the maturity level of the student.

The plan was to eliminate or at least avoid disjointed incrementalism; that is, the piecemeal rationing out of knowledge. Sequential development with continuity of knowledge and experiences is a goal. Figures I and II were designed to depict three essential principles: Continuity, sequence, and integration. Vertical continuity of the program includes career education from K through adulthood. The principle of sequence includes and emphasizes not duplication but rather deeper levels of study of the world of work, self, and other human activities. Integration refers to the activities and concepts that are refined by virtue of moving along the oblongitudinal paths, an action which eliminates isolated efforts yet promotes consensus. Incorporation of the principles of continuity, sequence, and integration enhanced the development of a coherent program with high probabilities for cumulative effects on student behaviors. Compartmentalization is removed, thereby providing the student with psychological unification of educational experiences. The career education program is the thread which adds consistency, visible integration, coherency, and reinforcement between disciplines. For some educators, the program represents a serious philosophical conflict between the traditional view of academic subjects and industrial arts. However, those supporting the program welcome the change, and they labor to demonstrate that there is no antithesis between the world of work and academics.

The program is a fusion of ideas, strategies, and activities derived from collective effort. This, as we all know, is exceptionally demanding because people with individual differences must collectively arrive at interdependent actions and ideas. Those who work with the program know the conflicts of ideas among individuals, interest groups, and factions within schools. Reform and revolution take place within the persons involved in the project. All those involved, administrators, teachers, specialists from several fields

FIGURE II

CONCERTED INTERACTIONS OF COMPONENTS OF MARYLAND CAREER EDUCATION PROJECT



and industrial arts, are finally providing a social model of interaction.

A dedicated industrial arts teacher involved in this project, continually exchanging ideas with others, cannot escape a change of thinking and feeling. Perhaps he may learn from the counselor participant that the psychological principle he learned while working for his master's degree is now misinformation, and conversely, of course, your technological input would be informative to him.

Individuals who have a good measure of mental adaptive flexibility express satisfaction and reinforcement with the productiveness of the program. Frustration is experienced by those who cleave to a narrow specialization, or have status in one discipline, or rigidly hold to a theoretical position. They cannot experience the basic premise of growth; that is, to learn, unlearn, and relearn. Functioning members of the team demonstrate the ability to remain open to new experiences. Openness permits information from other fields to permeate the mental matrix of their present knowledge, and hopefully it is incorporated and internalized. The total experience of reflexivity that is the effect of thinking, feeling, and willing while engaged in the program often brings about a new consciousness. The art of interacting and relating—isn't this what we all need—what our profession needs? We need adaptive men and women who display the ability of collective ideation which, when professionally performed, leads to improvement of industrial arts by way of the multi-disciplinary approach.

Imagine yourself an industrial arts professional interacting with English, home economics, guidance and counseling, science and math teachers. Your goal would be to collectively devise a concerted program of activities for career development. Each of you would be charged to integrate knowledge from your discipline into career-relevant activities. In the interaction stage, that is, during planning, I am certain you would have excellent cognitive input about the world of work, but could you accommodate the input of the others? Would you emerge from these interface sessions feeling psychologically successful? Could you provide the necessary intervention to promote a good relationship between groups or individuals? Could you promote your own self-actualization in a manner that does not suppressothers? If we, as industrial arts educators, hold out the expectation for our students to work together, to develop social skills via role playing, group projects, etc., then we would do well to demonstrate that we too can work with a wide range of professionals. Isn't this what we really fail to do? Ask any student, or look about you. Are we interacting with people from other professions?

To my satisfaction, I have seen participating industrial arts educators and other professionals emerge with a new respect and status.

ROLE AND CONTRIBUTION OF INDUSTRIAL ARTS

The Department of Industrial Education at the University of Maryland, headed by Dr. Donald Maley, jointly assumed the responsibility for housing, content, and instruction of 15 task force teams for career education at the junior high level. Ten of these teams consisted of five teachers from industrial arts, home economics, science, math, guidance and counseling. These were task force teams which gained experiences relative to career education and who returned to their schools as a cadre capable of initiating innovative programs within the schools. The input or process of developing teams of teachers that would work in their schools with a concerted program is briefly described. Interested persons desiring more details should contact the writer for further information.

The teams were guided to form a simulated company and to make decisions about organization, production, processes, and products. Role assignments were made and researched, and participants interviewed their counterparts in industry. The line production scheme, demonstrating the interdependence of workers upon one another with hands-on experience, resulted in a completed tangible product. The products were researched and marketed. All the teachers found practical application for the knowledge and skills from their professional fields. Group projects were also completed within the nine clusters of agriculture-business, health, construction, manufacturing, communications, transportation, personal services, social services, and real estate-financial banking. Following the multi-disciplinary workshop activities, the participants developed plans and strategies for implementing career education in their schools. The plans were submitted to an advisory council which assisted the teachers in the administration and introduction of the programs into the schools. The teams were to generate a synapse effect or "Hawthorne effect" to a point where other teachers would voluntarily join the career education team.

Home economics structured role-playing situations in which individuals experienced family membership, entrepreneurship, or the role of an employee. Boutique operators became decision-makers according to consumer demand, zoning limitations, and working capital. The mathematics teachers demonstrated applications of mathematics to a sample of career areas in each cluster. A wide array of gaming activities were experienced; they were the purchasing of homes, the paving of driveways, the construction of furniture, landscaping, and purchasing of stocks and bonds. Concurrently with the above experiences, participants received professional instruction for the examination of the broad array of human requirements for occupations as well as the life styles that go along with them.

ELEMENTARY COMPONENT

While there is input from the agencies depicted to the left and to the right of the elementary component and the resource specialist, I will only briefly describe the role of industrial arts within this component. Twenty-three individuals, including four permanent staff, 19 elementary teachers, and two industrial arts teachers form the Production Committee for Career Education, develop materials for the elementary component. This committee translates academic content into manipulative and other experiences appropriate for the elementary school I.A. laboratory.

Industrial arts activities are integrated with each class, and the teacher actively participates in the laboratory experiences. Not only do they develop written materials with behavioral objectives and activities, but they also coordinate laboratory activities for the career education teams.

INSTRUCTIONAL TELEVISION COMPONENT

This component of the project attracts many critics because of its state-wide exposure. Viewers who do not realize that the 15 20-minute products are a small part of the total program tend to be overly critical. It is necessary to understand that manuals prescribing pre-viewing activities are used by the teachers. This software includes activities for the nine occupational clusters and is used prior to the telecasts. Following the telecasts, post-viewing information and activities are suggested. When used as intended—that is, by properly trained teachers functioning within the total program—the telecasts are very effective. Unfortunately, too many educators express unintended expectations and unwarranted criticism.

CAREER RESOURCE NOTEBOOK

A resource book primarily for use by supervisors and administrators of elementary, secondary, and post-high school education is another vital link of the project. It provides operational models, planning models, resources, and information to implement concepts of career education. There is evidence that teachers are using parts of the notebook as a guide for their actions in the schools.

WORK-ORIENTED PROGRAM

Designed for dropout-prone junior high school students (ages 14 to 16), this component provides a half day of school with a half day of employment under school and job supervision. The program does not differ from the usual co-operative education program in form or organization. The only real difference is its involvement in the input from the total project. Career education concepts related to the self, decision-making, information about occupational clusters, and many other elements from the total project flow in as input into these programs. Not only is there flow of information into the component but there is also a new co-operative thrust from within toward the total program. The telecasts are small important parts of the total program; they have their limitations, but gain their strength by being part of the total program.

INTERACTIVE LEARNING SYSTEMS

This component includes reality-grounded information disseminated to senior high school students. A computer system provides data on colleges, vocational technical schools, scholastic requirements, sources of financial aid, and general and specific job data for a given geographic area. A liaison person from the Maryland State Employment Services provides updated information about current job openings.

In addition to the computer system, the VIEW microfilm system is used. Occupational briefs of eight pages on two apperture cards are used to provide current data about jobs and careers. The system enables the student to obtain a print-out of the information to take to his counselor or home for study. Employment services to bridge the gap between school and the first entry level job are performed by two staff coordinators. Follow-up activities and surveys are planned.

EVALUATION

A third-party evaluation team identified and collected performance information. After thorough analysis, it reported differences and discrepancies from the objectives set forth for the total program as well as for each of the components. Evaluation is a continuous process proceeding by defining and redefining expectations, identifying discrepancies between program activities (performance), specific goals, and total interaction, and providing program managers with information for continuous decision making. Further methods of evaluation included presence of the team at all staff meetings and conferences, obstrusive and non-obstrusive data, collection techniques, interviews, audio tapes, video tapes, monitoring, check lists, informal conversations with teachers and students, progress reports, questionnaires, standardized tests, and newly constructed tests.

While each component is evaluated separately, it will be a matter of time before the total concerted effort and its effect on the student, teacher, school, and community will be known. The long-range interaction effects are expected to bring about a change in the feeling, thinking, and methods of operation of school systems and all those directly and indirectly related to them.

Industrial arts cannot remain neutral or aloof. Never before in history has there been an opportunity for the profession such as is presented today. We must seize this opportunity to play a meaningful role, earn respect and dignity, and emerge with a new image. The Maryland model is yours to provide you direction, for you to adopt or modify, but remember it is the interaction that will make the difference. Educators working together in a multi-disciplinary approach will provide students with a much-needed model for living in an ever-growing and crowded world.

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Career Education—What's in it for Industrial Arts?

William W. Mamel and Leonard Sterry

The U.S. Commissioner of Education, Sidney Marland, with the support of the President in his State of the Union address and of Congress with pending legislation, has made a strong commitment to provide career education programs for all youth in this country. He has also suggested that industrial arts, through its activities, can make a significant contribution to students through career education. During the past several months, the U.S. Office of Education has been attempting to provide materials through development of "clusters," and personnel from the American Industrial Arts Association and the Industrial Arts division of the American Vocational Association have attempted to develop criteria and guidelines for funding industrial arts for career education activities. Everyone agrees that career education is a much-needed program for students. The key question appears to be, "What happens in the classroom?"

Industrial arts educators, in attempting to design and develop meaningful activities for students, are experiencing considerable difficulty as they try to modify progress based on traditional content and methodology. Almost every day, our office receives a call requesting information regarding "new" programs in wood, metal, and plastics which reflect career education thinking. Traditional vocational educators are also experiencing difficulty in accepting career education concepts if their programs are based on filling labor market quotas rather than meeting the needs of people.

Career education, or career "literacy," is different from either vocational education or traditional industrial arts education in both content and instructional pattern. Content for traditional industrial arts programs and for vocational programs generally has been derived by analyzing and classifying skills and information needed to perform in a job or to complete a selected project. This method of identifying content provides for organized activities and efficient teaching, but allows little opportunity for individualized learning or decision making due to its cookbook approach. It makes little or no provision for students to participate in activities which relate to the world of work other than in manipulative-technical knowledge situations. (Current vocational legislation even acknowledges that preparation for and assistance in making career decisions is a more valid determinant of future employment success than specific skill training.) The narrow bases from which most content in the field of industrial arts is derived—woodworking, metalworking, drawing, etc.—are not representative of industry, nor technology, nor the world of work.

If industrial arts is to make a contribution in programs of contemporary education, and more specifically to career education, broader bases must be used from which to obtain content. Industrial occupations in today's world are in the fields of manufacturing, construction, communications, energy, and transportation. These fields also utilize the materials, processes, techniques, and sophisticated technology needed to produce goods and services for man. Career literacy will result when students are exposed to the many facets of this real working world; when they understand the inter-relationships which exist in the complex industrial system; and when they can, on their terms, explore an area of interest and assess themselves in relation to its demands. Are we so comfortable and hung up with tradition that we ourselves are afraid to face the real world? Or do we accept the challenge and change our content, methodology, and activities to give students a good, long look at industry, technology, and the world of work?

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Alternatives for the Future of Industrial Arts: I.A. Redirected by Influence of Career Education

Ethan A. Svendsen

Career education is not just a new name for "business as usual." Career education is a much broader concept than an improved system of exploration, guidance, and specialized preparation for the resulting occupation that an individual selects. Unquestionably, improvements are greatly needed in the procedures whereby an individual seeks out and prepares for his livelihood. No doubt a properly conceived and implemented career education program will result in vast improvements of these procedures.

But in its fullest and best expression, career education is a proposal for renovating American public education, for applying correctives, and for eradicating those educational evils and deficiencies that operate against the development of the fullest potential of every individual and that prevent the realization of equality of educational opportunity.

We do not have the time to present a detailed analysis and description of all the ramifications of career education. But we do wish to discuss some of the characteristics of career education which are particularly important for the rest of the presentation.

The AVA convention at Portland, Oregon, this past December was predominantly concerned with the career education concept. An AVA task force of 100 leaders and representatives met on December 2 (the first day of the convention) and issued a report on December 3. The report was part of a continuing effort to establish the position of AVA with reference to career education. The report states in part that vocational education will "...support the retention of vocational education as a significant and identifiable component of career education." These phrases are selected to show that the AVA does not regard career education to be synonymous with vocational education, that vocational education as represented by the AVA is but a part of the total concept of career education.

In a fuller development of the career education concept, Dean Keith Goldhammer, of the School of Education at Oregon State University, presented a thoughtful analysis in a speech to the Division of Industrial Arts of the AVA. In part, he stated that every individual has several careers for which he must be prepared. Of course, he must pursue a career in which he is a "producer of goods or a renderer of services." This is the economic element. His livelihood depends upon it, and, in addition, the continued welfare and vigor of society demands that each member make a contribution to its on-going economic activities.

But, points out Dean Goldhammer, there are at least four additional careers in which the student must be prepared to make decisions here and now and in the future and with which the school must be concerned:

(1) His career as a member of a family group.
(2) His career as a participant in the social and political life of society.
(3) His career as a participant in avocational pursuits,
(4) His career associated with religious, moral, and aesthetic concerns.

Having pointed out five of man's careers or areas of activity, Dean Goldhammer builds a strong case that the vocational career must be the "central unifying force" in the careers curriculum. He stated, "It is possible to build a functionally relevant curriculum for each learner, helping him to acquire the depth of knowledge about culture, society, the physical world, and man within it, by centralizing the focus on man's vocational career."

The conclusions we must draw point to an American education that demands of each of its curriculum areas that it make its just and reasonable contribution to student development in each of these five career areas. A properly conceived career education will provide guidelines to help insure that the grand potential and promise does not degenerate to the status of a sterile screening process, under the name of exploration and guidance, and a subsequent training routine under the name of what can be a liberalizing kind of vocational education.

Career education involves much more than selection of and preparation for an economic occupation. It is not a replacement of vocational education or industrial education any more than it is a replacement of science, mathematics, social science, English, and other so-called nonvocational subject areas. Career education is meant to be a fusion of academic and vocational education. Career education is a call to all of education to reduce the artificial distinctions between learning for the sake of learning and learning for use in living, a call to arrange all of the elements in the learning environment so that the learner sees applicability of the learnings in one or more of his on-going life careers.

Career education cannot be "pasted on" to what now exists. The concept is much more profound and far-reaching than that. Dean Goldhammer used the word "permeate" to emphasize the complete integration of career education. Even the areas of study that carry the names of "occupational education," "vocational education," and "occupational guidance" have been woefully deficient in practice when measured by the far-reaching principles of career education. And so has industrial arts education.

These points and comments about career education have been selected because they lay a foundation for what follows about industrial arts education for the public schools.

The learnings which industrial arts education must make available are associated with functioning industry. These learnings may be readily woven into a pattern whose warp and woof are the activities of those human beings and members of society whose occupations result in the goods and the services that are connected with manufacturing and construction technologies.

This is not a new idea. We will cite but two of our "patron saints," Frederick Bonser and John Dewey. Bonser's well-worn but well-conceived statements defined industrial arts as those occupations by which changes were made in forms of materials. He then expands his statement to involve the study of the social problems that attend these occupations.

It is extremely interesting to review John Dewey's direct and indirect characterizations of industrial study for educational purposes. Perhaps the most readily accessible selection is Chapter VI from The School and Society (1899). The chapter is entitled "The Psychology of Occupations." Let me quote the last sentence of that chapter:

> The occupations articulate a vast variety of impulses, otherwise separate and spasmodic, into a consistent skeleton with a firm backbone. It may well be doubted whether, wholly apart from such regular and progressive modes of action, extending as cores throughout the entire school, it would be permanently safe to give the principle of "interest" any large place in school work.

Now let me offer an interpretation: The occupations systematize a vast variety of youthful impulses into a consistent skeleton with a firm backbone. Without these occupations as a core, it is doubtful whether it is permanently safe to give the principle of interest (and relevance) any place of importance in school work. Against the background of his total philosophy, Dewey's concern for man's occupations as the core of public education has been the best foundational statement to come out of this century to undergird industrial arts theory. In addition, we find a rather contemporary definition of career education.

But Dewey, Bonser, and others were never really understood then or since by industrial arts practitioners. Or if they were, they were given superficial lip service only. Perhaps, under career education, the time for the best of the ideas of Dewey and Bonser has arrived.

Obviously, we are not building a case for industrial arts as we find it conventionally practiced in a majority of public schools and in large numbers of teacher-preparation institutions. The purposes and goals of many of these educational organizations are equally open to criticism. What I'm referring to is neither good industrial arts education nor good career education. Industrial arts has been too slow in moving away from an obsolete mode of operation. This is in spite of the vigorous and wholesome curriculum development activity taking place since World War II. Industrial arts has been notorious for the hypocrisy of proclaiming a laudable theory but maintaining a practice that belies that theory.

But in any change process, we must not neglect nor abandon the long tradition and development of industrial arts education theory. The fundamental principles are sound. They must be rescued from the archives, put into contemporary language, augmented with more recent insights, and used as a corrective—a corrective for any misguided efforts to replace industrial arts (at its best) with a too-narrow preoccupation with occupational selection, tryout, and preparation. Even this early in the life of career education, I note signals that threaten the possibilities for industrial arts education to make its contributions to all of the life careers discussed by Dean Goldhammer. If influential educators who are directly connected with the areas of industrial study fail to conceive of career education in its broader educational aspects, industrial arts education may be forced to abandon its attempts at implementing the best of its theory. Reasons can be discerned in the history of industrial education for the difficulty industrial arts education has experienced in avoiding the exclusiveness of the role of occupational exploration and guidance as the predominant parts of its mission. Under career education, the opportunities for escape may at last be at hand.

We strongly support career education, not only for its potential to renovate the whole of public education, but also in the hope that at last a movement has begun that will demand from industrial arts education the best of its theoretical expectations. It can be documented that the basic ideas of career education are encompassed by the evolved theory of the industrial arts curriculum area. The early twentieth century theorists laid broad foundations, and more recently expansions and modernizations of these concepts have resulted in curriculum experimentation and implementation. Thus, even before career education came to front stage, industrial arts curriculum developments (some under federal funding) gave promise of turning the tide. Some of these curriculum projects renounced the industrial arts name, and ostensibly any industrial arts influence. Others accepted and capitalized upon the 100-year tradition of the industrial arts curriculum area. No subsequent events have yet proved which was the best strategy.

In any event, redirection for industrial arts education under the influence of career education may be the wholesome and hastened renovation so long awaited by many in the profession.

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Career Orientation for Elementary Schools: The Second Year of Project LOOM

James R. Heggen and John J. Geil

One year ago, we reported to this convention the establishment of Project LOOM and reviewed our first year of activity. This report may be found on pages 70-72 of the Association's 1971 Convention Proceedings. We found it necessary then to build a case for elementary level occupational education programs. We noted that occupational education has long been one of the basic roles of industrial arts, but that not much headway has been made, especially in the elementary grades, due to the lack of resources, personnel, and space within the curriculum. Identifiable progress began in 1963 with the vocational education act, followed by the 1968 amendments. Florida's efforts in this direction began in 1969, with a study of all aspects of vocational education. This was followed, in 1970, with extensive legislation which has literally transformed the state's vocational education program. The word in Florida now is "comprehensive vocational education," which means that all students will have an opportunity to learn about the world of work, about themselves in relation to the world of work, and to prepare for gainful employment whether they elect college or not.

It is no longer necessary to dwell upon the philosophy or rationale for career education. The need is established. Career development has been named the number one priority by the U.S. Commissioner of Education. Florida is well on the way to showing what can be done when resources and personnel are committed.

When we started, there was little to follow in developing the materials and methodology for elementary-level occupational awareness programs. There are no studies which would indicate that, if we do certain things with children in the early grades, desired outcomes relating to work will result at age 18 or 25 or 30. We do know that in most instances, occupational decision making is a haphazard process which leaves many people in jobs for which they are poorly suited, have no real talent, or, worse, working at jobs below their capabilities, simply because they never came to know about and believe in themselves in this context. The goals of Project LOOM are to develop materials and methodology which, when applied in a low-key manner throughout the elementary grades, will help students acquire broad knowledges of the working world; learn their own innate abilities, likes, and dislikes; and acquire a healthy regard for the work of others in society.

"LOOM" expresses our basic concern—that everything we do must be keyed to the needs of the learning individual. Learner-Oriented Occupational Materials put the individual learner at the center of the educational effort. Learning is a natural condition of the human organism, and we feel there is no reason why it should not be enjoyable in the schools.

All LOOM units feature hands-on activities. Since adults work in active contexts, it seems reasonable that children will best learn about jobs and the working world by being involved in real or simulated work experiences. Oral and written work is, of course, included, but activities form the backbone of each learning unit. The student learns about the world of work and, equally important, learns about himself in that context.

Practicing elementary teachers write and develop the units. under the guidance of the project directors. Materials are tested in typical classroom situations before being submitted to the project. The units follow a uniform format which consists of a teacher's guide, the student materials, and a resource section. Realia activity kits prepared for each unit include A-V materials showing real people in real work roles, items used by workers, and other learning materials. Items which are too large or costly to be included in the kits are represented graphically or simulated. To complement the packages, tool and equipment lists for each school center which will use the program are being developed.

When the completed LOOM units are received at project headquarters, they are duplicated and made available to all participants for experimental use. Teachers choose for use those units that seem most appropriate for any given instructional time, to supplement the regular instruction. Thus the units are tested not only by the originating teacher, but also by other project participants.

Approximately 60 LOOM units were completed by June 1971, covering a wide variety of occupations and professions. We then conducted a series of one-week summer workshops for participants in the 13 school districts cooperating with the project. The major purposes of the workshops were to evaluate the units, conduct micro-teaching activities using the units, assist participants in developing tool skills, study occupations through on-site visitations, and work out implementation patterns for 1971-72. Participants received three quarter hours of graduate credit from Florida State University plus a stipend.

During the current school year, the project has been expanded to include 130 participants. We are revising all the units written last year, writing many new units, field testing in diverse situations, and refining curriculum integration patterns. To accomplish this, the project directors conduct a series of one-day workshops in each district. The project provides substitute teacher pay and funds for materials. A local technical consultant (usually an outstanding industrial arts teacher) works with the elementary teachers to assist them in designing activities, developing tool skills, advising on safety and other matters, and in locating needed information and resources.

Prior to the end of this school year, all new and revised LOOM units will have been received, checked, and duplicated for summer workshop use. Our workshops will be similar to those last year, except that we now have more usable materials and many early problems have been solved. We will be able, therefore, to concentrate more on teacher preparation and unit evaluation. Plans are underway for special workshops in at least two counties which would run up to six weeks in duration. In these, groups of teachers would conduct summer school classes with students during the morning hours and then work on personal and unit development in the afternoons. Cooperating districts will employ teachers for the summer.

With the history and method of Project LOOM reviewed, it is appropriate now to report on findings. We are often asked, "How do you evaluate the program? How do you know that the LOOM units will accomplish what you intended?" Short-range evaluation is no real problem. Each unit is tested and refined by the authoring teacher to make sure that the performance objectives are attainable. This is followed by peer critique and field trials in the several centers. We are reasonably confident that, with adequate teacher preparation, each unit will accomplish the objectives set forth for that unit. At this time, however, it is not possible to say conclusively that students who will experience the total LOOM program in the future will possess, when it's time to make decisions and go to work, the knowledges, attitudes, characteristics, and skills desired. Longitudinal studies are needed, but must be deferred in favor of developing the program. For now we are working on the assumption that if the students and teachers like the program, it's good, and if they don't, it's not. We can report that almost everyone who is involved likes the LOOM program and feels we are going in the right direction.

The simple and direct methods used in the project may make data-conscious educators nervous, but are appealing to teachers and administrators in the field who are swamped with surveys, evaluations, testing, data collection, and red tape. As one assistant superintendent put it, "The LOOM program is simple, practical, and workable, and not another slice of pie in the sky—which we don't need."

Perhaps our strongest feature is teacher involvement. Working with teachers, assisting them in learning new ways to be active with their students, giving them an opportunity to employ their creative abilities in developing LOOM units, is yielding results beyond the immediate goals of the project. In one school, for example, a teacher got so involved in working with the unit, "Should I Be A Printer?" that she expanded the activity beyond the unit with her class and ultimately got the entire school involved. This teacher and others are demonstrating that improvements in reading skills, for example, can be achieved through methods using activities with tools and materials. Measuring and computational skills are learned well in units such as "Should I Be A Baker?" Students are acquiring exciting new vocabularies, words that are not standard for their grade levels, through working and role-playing in units dealing with the meteorologist, the pharmacist, the veterinarian, the accountant, the photographer, the electrician, the ice cream maker, the archaeologist, the podiatrist, the travel agent, the shipbuilder, the oceanographer, the food-store worker, and many others.

About the only criticism we encounter comes from our participating teachers—they say we are moving too slowly. They want us to intervene and force the changes needed in the elementary school day and in curriculum requirements. But making changes in education is a complex, slow process. Overcoming system inertia stemming from the "we teach as we were taught" syndrome requires time, money, manpower, and a proven method of instruction. Accreditation standards, certification requirements, and other factors require time and pressure for modification. Teacher educators need to realize that academics, though necessary, are not sufficient preparation for elementary teachers who will be teaching children about the working world.

And, we need specialists to work with the elementary teachers. Classroom teachers will, due to the tremendous number of students involved, have to be the principal conductors of elementary-level world of work programs. They need the assistance of a new breed of specialist. Industrial arts teachers, home economics teachers, and others who have not only broad knowledge in their fields but also competence with elementary children and, ideally, some work experience of their own, are sorely needed now.

Specialists, plus money, plus orientation for those who control education, plus in-service and pre-service programs, will be needed to implement the LOOM program or any other elementary program dealing with the rather revolutionary concept that children should begin to learn about the working world when they enter school.

At about this point in our presentations on Project LOOM, someone usually says with enthusiasm that it is high time a program was developed for kids who like to use their hands. True, we say, but show us a brain surgeon who uses only his head. Then someone usually says that LOOM will help kids make up their minds earlier about working. We say, not necessarily earlier—just better.

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Career Education: An Employer-Based Approach

Ralph C. Bohn

In an effort to improve the preparation of the Nation's youth for their future in the real world beyond the classroom, a new concept of education has been suggested by the Office of Education. This concept is called career education. Career education is proposed as a comprehensive educational program designed to eliminate the "gap" between formal school and the world of work.

Four approaches to career education are planned: a program based in the public schools, a program based in the home and community, a program based in the local community (residential program) and educating the whole family, and a program based in a variety of real-world environments called Employer-Based Career Education (EBCE). The Far West Regional Laboratory, Berkeley, California, in cooperation with the Northwest Regional Laboratory, Portland, Oregon, and the Center for Research for Better Schools, Philadelphia, Pennsylvania, have been selected to conduct initial planning and design work necessary to establish two pilot models of EBCE in the Fall of 1972. This presentation will emphasize the EBCE model being developed in Berkeley, California. While many of the characteristics will be common to both programs, the efforts are being kept independent to foster individual and creative solutions to the challenges presented by this model.

A variety of definitions have been advanced for career education. For EBCE, a broad definition has been selected. "Career" covers the individual's total life: his occupational, social, and personal concerns. Career education is envisioned as education for one's progress through life. An individual should acquire and develop knowledge, attitudes, and skills necessary for meaningful vocational, avocational, leisure, social, and personal pursuits. Career education enables the student to assess and develop realistically his own interests and his potential in view of the opportunities offered and constraints imposed.

CONCEPT OF EMPLOYER-BASED

Employers are people organizations who employ other people in profit making, governmental, and other not-for-profit enterprises. They include large industrial firms like General Motors Corporation, small businesses like a family-owned hardware store, government or quasi-government operations like the postal service, and public, non-profit agencies like the American Red Cross.

EBCE will be employer-based in that employers, as a group, will play a dominant role in deciding on educational goals and in mobilizing and allocating resources to achieve the established goals. The employer-based model will emphasize real-life work environments for its learning settings—as distinct from the classroom settings of the school-based model.

Another important difference lies in governance. The governance of school today is usually in the hands of a single agency, the school board. The governance of the employer-based model is conceptualized as a partnership of a variety of interests and involvements. Public and private employers, community agencies, and the education sector will join together to form a new alliance for the development and management of EBCE. This "consortium of agencies" will share both the power and the responsibility for establishing and governing this unique type of educational program.

GOALS OF EBCE

The fundamental goal of Employer-Based Career Education is the preparation of the student for a satisfying and fulfilling career in the broadest meaning of the term; that is, for his progress through life. Consonant with the embracing goal of healthy student growth and responsible personal fulfillment, and central to the focus of EBCE, is the preparation of students for the attainment of satisfying employment, either immediately or after further education. The distinctive goals of the EBCE Model, stated at the broadest level, are as follows:

1. The EBCE Model aims to provide a viable alternative pathway to the existing education programs for young people who wish to achieve comprehensive career education. The model will serve a broad range of students on an open-enrollment basis.

2. EBCE aims to increase the relevance between education, the world of work, and life in general by adopting direct student participation in diverse life situations as the central theme and organizing center of the individual's experience within the educational system.

3. EBCE seeks to improve upon existing programs of general, academic, and vocational education by integrating the positive aspects of all into a new educational experience.

4. EBCE seeks to broaden the base of community participation in education by involving the employing sector more directly and significantly in the process of preparing students for responsible careers within the community and the world of work.

5. EBCE aims to broaden the base of student participation in the educational process by progressively involving students in decision-making processes which determine the nature, extent, and direction of their individual educational programs.

EBCE proposes to serve the major goal of bridging the gap between education, the world of work, and other subsystems of society. In order to do so, it adopts as system goals the meeting of societal and individual needs/demands as measured by several criteria developed above. As minimal outcomes, the model will specify standards of performance with respect to adequacy of outcome, effectiveness of communications, relevance, responsiveness, accountability, and cost-effectiveness.

DISTINCTIVE CHARACTERISTICS OF EBCE

EBCE is being developed as a significant departure from the traditional program of education. A major thrust has been directed towards establishing a viable alternative to existing schooling. Many of the characteristics associated with education and schools will be supplanted or changed beyond recognition. Students joining EBCE will be confronted with an educational program void of classrooms and teachers. Instead, they will be involved with a variety of new concepts and will work with representatives of business and industry, the community, and special EBCE personnel.

The special characteristics which distinguish EBCE from existing schooling include:

1. Learner-Centered. This is the most distinctive characteristic of EBCE and serves as the point of departure for curriculum planning. The educational needs and career objectives of each individual will be used to plan and develop his unique educational program. This procedure is in strong contrast to traditional designs which are based on the needs of society, the goals of subject matter specialists, and philosophical or psychological positions.

2. Individualized Planning and Instruction. In support of the learner-centered principle, curriculum planning and instruction are designed to be carried out primarily at the individual level. Students are diagnosed, their programs are designed and developed, and their instruction operationalized on a one-to-one basis wherever feasible. This recognizes the differences which exist in students with regard to ability, aspiration, learning pace, and other factors that affect the educational experience. This procedure is in strong contrast to the prevailing practice of today—"to design generalized curriculum and then attempt to adjust it to the individual learner."

3. New Learning Environments. The EBCE student is not confined to a classroom or even a school. Rather, his educational activities take him into the community in a great variety of environments. These places, identified as "territories," are developed as relevant and responsive learning environments to nurture and facilitate the student's mastery of learning tasks.

The scope and utilization of the territories is limited only by the subtlety and imagination of the instructional staff. Any place where people live and work could conceivably become a resource for an EBCE learning experience, making EBCE a huge "school without walls."

4. Employer-Based. A major share of educational experiences will occur in a work setting, thus emphasizing a career orientation. These experiences will be designed to fulfill a variety of goals, including career exploration, pre-professional experience, career-related knowledge and skills (science and mathematics, for example), and initial job entry skills. Emphasis will be placed on involving the student in real rather than vicarious experiences. In addition, the experiences will be planned to meet specific student goals, rather than the goals of the employer.

5. Performance-Based. The EBCE student is not "working for" grades, as he is in the traditional school. Rather, evaluation is based on the performance of the student in the "functional context" in which learning takes place, in terms of goals which are designed in part by the student himself.

What constitutes satisfactory "performance" will vary from one student to the next, as goals are geared to the ability and expectation levels of individual students. Performance will, therefore, not be reduced to submitting students to standardized tests.

6. Experience Trails. Experience trails are the individual educational programs designed for students. A sequence of purposeful experiences is brought together and arranged into an instructional order. The student then uses his experience trails to guide and order his education.

The trail is the combined effort of the student and EBCE staff members. It is not a fixed entity, but is modified and adjusted as the student gains new knowledge and modifies his goals and aspirations.

Each EBCE student will have an experience trail which will provide continuous identity with learning sequence and progress, as well as identify the places where performance-based evaluation should take place.

7. Learning Modules. The module is the smallest instructional entity used in building experience trails. Each module is designed to fulfill a single student objective or a series of closely related objectives. As an instructional entity, the module identifies a completion point as a student progresses along his experience trail.

A student may engage in a number of modules in any given time period. Though at any given moment he is working with only one module, it is often set aside to permit him to work on other modules built into his experience trail. For example, an early experience trail for a student may include modules in reading, mathematics, physical science, and career exploration. During a typical morning he would be engaged in individualized instruction in reading, mathematics, and physical science. The activity would be followed by viewing a film on careers in transportation. In the afternoon, he would visit a local airport to observe people working in a variety of transportation careers.

The length, profile, and type of learning module will vary with the learning objectives of the student and with the extent and complexity of the learning experience.

8. The Career Education Center. The student is provided a "home base" for his EBCE experiences. The Career Education Center is designed as a hospitable environment for discussion and planning, tutoring, policy making, social activities, and materials organizing and storage. The Center avoids the "look" of school since there is no need for rows of chairs, wall-to-wall chalkboards, buzzers, and bells.

The Center "atmosphere" permits the student to be relaxed among his peers and be able to meet comfortably and openly with the EBCE staff. Informality and warmth are emphasized; authoritarianism is avoided.

9. The Learner's Support Team—STAFF. A diverse group of people with many competencies are needed to design, implement, and manage the instructional system. Each student will come into contact with a number of people, each contributing to the student's progress on his experience trail. These include:

a. Coordinators — the people directly involved with helping each student plan and develop his individual experience trail. The coordinator is the key person in working with students. He has the responsibility of diagnosing student entry levels, goals, and interests, assisting students to plan and develop an educational program, monitoring student progress, and assisting students in making program adjustments and in solving their day-to-day problems.

b. Resource Person — individuals in the territories or at the Career Education Center having responsibilities for assisting students with learning tasks, serving as instructional guides or experts, providing information to the learner, assisting in locating and making use of material resources, introducing students to new concepts and skills, and working with coordinators to build the student's personal and professional self-image.

There are a number of people who have major responsibilities for the student's progress but have only an occasional or chance contact with individual students. These include:

a. Curriculum Designers — the people designing learning modules and selecting, adapting, or developing materials required for the mastery of learning modules and for the implementation of planned experience trails.

b. Territory Developers — the people mapping and developing territories, establishing and maintaining liaison with resource personnel, and maintaining information on territories and resources.

c. Management — the variety of people responsible for the efficient and integrated operation of the Employer-Based Program of Career Education.

10. Additional. Many additional characteristics will distinguish EBCE from the traditional school program. These include implementation of the concepts of free exit and entrance, failure-free (some students will simply take longer than others), and efficient transfer back into the traditional school program or into collegiate education.

Emphasis on individualized instruction will take advantage of the developing array of instructional media. The use of media will be enhanced through assignment of students to a variety of individual activities in territories established in business and industry, as well as community and civic agencies.

THE END PRODUCT

Upon completion of the EBCE program, each student should have acquired competencies and met requirements which enable him to:

--enter a two/four-year college for academic/professional training, or
--enter a two-year college or technical school for vocational/technical training, or
--enter the world of work (apply for a job for which he has acquired entery level skills), or
--engage in a community service or other service activity, or
--engage in a satisfying, self-realizing involvement of his choice, or
--implement a mixture of the above.

These categories represent the gates through which the individual can enter to continue his personal growth and become the kind of person he has the interest and potential to become.

IMPLEMENTATION AND FUTURE PLANS

During the Spring of 1972, the Far West Laboratory at Berkeley will bring in a small group of students (5 to 10) who will become involved with the initial concepts for EBCE presented herein. The results of this initial experience in Employer-Based Career Education will be the establishment of the guidelines and procedures for the implementation of a pilot program for 50-100 students in the Fall of 1972. Oakland, California has been selected as the site for this initial venture into an exciting and creative aproach to education.

Dr. Bohn is the Dean of Educational Services and Professor of Industrial Studies at San Jose State College, San Jose, California.

Occupational Education in Comprehensive Schools

Joseph A. Prioli

The City of Brockton, Mass., is a combination industrial, business, and residential community comprising a total population of 95,000. Its local and regional industrial and business profile and proximity to the Boston area give it an identification closely related to the occupational and vocational opportunities and activities in the Commonwealth. Brockton is also the fastest growing community in the northeast sector of the United States and ranks twenty-third in the nation. Our present public school population of 18,400 ranks third in the state, and our enrollment projections indicate that we will expect to accommodate another 6,000 pupils in 1975. Because of community's economic and occupational characteristics and the diversified abilities and talents of our increasing large school population, we are extremely cognizant of the importance of occupational education as a principal component necessary to meet the multi-needs of a significant number of our students.

REGIONAL VOCATIONAL-TECHNICAL SCHOOL DISTRICT MEMBERSHIP

The City of Brockton is the largest community and the only city that is a participating member of the Southeastern Regional Vocational-Technical School District. Chapter 489 of the Acts of 1963, Massachusetts General Laws, established the Southeastern Regional Vocational-Technical School District as the primary occupational educational agency for Brockton students. An agreement to meet the immediate and specific needs of students was reached in 1967 regarding the cooperative administration of vocational education as it related to the Regional District and Brockton Public Schools. This cooperative agreement focused principally on the needs of students who could profit from a vocationally-oriented activity, but because of space limitations could not be accommodated at the regional facilities. To fill this gap, the Brockton Public Schools offers supplementary vocational programs. However, should the regional school's expansion program be activated, some supplementary programs could be housed in the regional complex. This policy has guided the administration of vocational education at our local and regional level for the past five years with satisfactory and effective results.

PRESENT OCCUPATIONAL EDUCATION PROGRAMS – SEPTEMBER, 1970

Vocational Special Needs Program

A vocational work-experience program geared to prevent school dropouts. This program is presently accommodating 205 high school freshmen, sophomores, juniors, and seniors. The five primary occupational training areas are automotive service, building construction, metal trades, human services, and food handling.

Child Care Program

A program to educate girls at the high school level to acquire competencies and skills in a wide range of child care professions.

Medical-Legal-Technical Secretarial Training Program

A program to educate high school girls in the business education program in the specific skills necessary to competently function in a medical, legal, and/or technical employment environment.

Distributive Education Program

A program within our business education framework geared to provide high school boys and girls with the competencies and skills necessary to function effectively in the present and future business and retail field.

Special Education Program

A program for the mentally retarded to provide the older retardate with occupational information and work experience based on the food handling area.

Nursing Assistants Program

A program to expose students to fundamentals of nursing, valuable to those whose interest is nurses assitant, nurses aide, licensed practical nurse, or registered nurse.

Cooperative Business & Office Education

A program that trains students who aspire to a career in the office and business community.

OBJECTIVES AND PROPOSED PROGRAMS AND ACTIVITIES

This section includes two basic concepts of our long-range planning objectives: what we are aspiring to achieve and those programs and activities that will be the vehicles to achieve our objectives. To clarify these two concepts, we will identify our objectives in upper case letters and the vehicles in lower case letters.

A. TO CONTINUE TO ADMINISTER OCCUPATIONAL PROGRAMS WITH THE REGIONAL VOCATIONAL-TECHNICAL SCHOOL DISTRICT BASED ON THE AFOREMENTIONED COOPERATIVE POLICY AGREEMENT.

B. TO IMPROVE THE ADMINISTRATIVE, MANAGEMENT, AND SUPERVISORY ORGANIZATION OF OCCUPATIONAL EDUCATION IN THE BROCKTON PUBLIC SCHOOLS.

- --appoint a full-time director of occupational education who will direct and be responsible for the entire occupational education program within the Brockton Public Schools. The director shall be the principal liaison between the local occupational education programs and the Southeastern Regional Vocational-Technical School District.
- --appoint staff personnel who shall be immediately responsible for a particular occupational program or component. They shall be directly responsible to the occupational education director and also to those administrative personnel whose sphere of responsibility is affected by a particular undertaking.
- --provide the necessary clerical help needed to implement the local occupational education program.

C. TO PROVIDE OCCUPATIONAL EDUCATION TRAINING OPPORTUNITIES FOR MORE STUDENTS.

- --provide occupational education training programs for students enrolled in special education classes, emotionally, mentally educable and trainable, and physically handicapped.
- --provide occupational education training programs for students defined as academically and/or scholastically deprived.
- --encourage students presently enrolled in a general course to participate in an occupational education that will lead to marketable or saleable skills and competencies.
- --encourage and provide more opportunities for girls to participate in occupationally-oriented programs.
- --provide a segment of our business education students with training consistent with the guidelines of occupational education; e.g., distributive education, cooperative business education, etc.
- --provide programs and activities to include students at the junior high level as aptitudes, achievement, talent, and age will permit.

D. TO PROVIDE FOR ADDITIONAL OCCUPATIONAL EDUCATION PROGRAMS.

- --in addition to our present programs, the following areas, classified by particular programs, are to be considered as potential training areas. Again, it should be stated that the following suggested areas of training would be in preparation for or supplementary to activities carried on at the regional complex, and their beginning and/or continuance would be dependent on the capability of the regional district to meet such needs at a certain point in time.

Vocational special needs

electronic communications, electronic industries, drafting occupations, graphic arts occupations, appliance repair, body and fender, blueprint reading, maintenance trades, plastics occupation, small engine repair, nurses aides, and clothing assistants.

Child care and development

to expand our competence and skill in areas of child care and development to include child health, educational, and recreational programs.

- --to expand and improve the present locally-supported high school restaurant training programs for educable retardates; e.g., baking, catering, soda fountain services, etc.
- --to explore the feasibility of initiating occupational education at earlier and adult levels and applying where appropriate.
- --provide occupational training in the areas of office and store clerks, garage work, clothing and home improvement areas such as housekeeping, appliance repair, landscaping, carpentry, and furniture upholstering.
- --utilize whenever feasible an appropriate work-study and on-the-job training activity.
- --expand and improve our present medical, legal, and technical secretarial pilot training program.

--expand and improve our present distributive education program, including a year-round cooperative school-community program.
--plan and implement a cooperative school-community, work-experience program with business education students with specific vocational goals; e.g., office education.
--provide a high level of instruction in the stenographic and transcribing skills with vocational objectives and standards. This instruction will include the use of a shorthand and transcribing laboratory.
--provide programs which have been affected by automation and technology; e.g., data processing, computers, etc.
--adult or evening school program.
--some of the implications of future adult involvement have been mentioned in the aforementioned sections.
--provide for an expansion of our current programs to include additional home and vocationally-skilled development areas.
--an increase in the areas of adult involvement in cooperation with business and trades to provide competencies needed for refresher or upgrading occupational skill development.
--investigate feasibility of consumer homemaking in line with family financing as part of home economics structure, leaving as much flexibility as possible.

E. TO IMPROVE THE CURRICULUM OFFERINGS IN THE AREA OF OCCUPATIONAL EDUCATION.
--improve the articulation of the training content beginning at the junior high and continuing into the high school and post-high school levels.
--provide academic offerings relevant to the occupational education training area.
--maintain flexibility in course of study offerings.
--structure the industrial arts programs to provide for prevocational and pre-technical activities.
--include whenever feasible an interdisciplinary content approach.
--include work experience or on-the-job training activities whenever feasible and educationally advantageous.
--provide for special tutorial activities to provide basic learning skills.

F. TO IMPROVE THE COMPETENCE OF THE INSTRUCTIONAL STAFF
--establish closer ties with colleges who are preparing individuals as instructors in occupational educations.
--encourage skilled tradesmen and industrial arts personnel to become vocationally certified.
--add qualified staff to maintain a low teacher-student ratio.
--institute a continuous in-service program to upgrade the entire staff.
--utilize specific individual staff strengths by instituting wherever feasible different staffing patterns such as team teaching.
--encouraging the staff to continue their professional growth by enrollment in graduate programs and participation in professional organizations.
--workshops geared for all school personnel aimed at a better understanding of occupational education and the needs of vocationally enrolled students.

G. TO INTENSIFY PUPIL PERSONNEL SERVICES.
--add staff whenever necessary to intensify the areas mentioned below.
--vocational information activity programs at the junior high level.
--vocational placement activities related to either on-the-job training or occupational placement.
--educational placement programs for those who would profit from additional schooling.
--follow-up activities to determine external adjustment as well as feedback regarding training effectiveness.
--provide classwork assistance to the retarded, others in need of such services, and their families.

H. TO IMPROVE THE TEACHING-LEARNING TECHNIQUES
--maximum utilization of educational technology; e.g., audio-visual programmed materials, computers, etc.

--design the instruction product and process to insure individual continuous pupil progress.
--utilization of the laboratory or application concept regarding skill or competency development.
--providing flexibility in programing students to provide for individual differences.

J. TO IMPROVE REGIONAL AND COMMUNITY COORDINATION AND PUBLIC RELATIONS
--the director of occupational education and other staff shall meet regularly with appropriate staff members at the Southeastern Regional Vocational Technical School District to insure continuity and purpose.
--the individual staff personnel, especially work-experience personnel, under the director, shall establish and maintain a close and effective relationship with business and industry.
--the role of the advisory committee shall be evaluated to promote improved effectiveness.
--the director shall work closely and coordinate with the regional vocational-technical authorities in the development of effective programs and activities. Such coordination would include:
--meeting periodically with the local public relations officer to enhance the image of occupational education and promoting the activities of occupational education.
--increasing utilization of vocational resources for community use.
--utilizing every available opportunity for the dissemination of helpful or significant information relative to the proposed programs; e.g., printed brochures, radio interviews, open house, etc.

K. IMPROVED FACILITIES FOR THE OCCUPATIONAL EDUCATION PROGRAM
--all of the high school involvement, grades 9-12, is housed in the new 16.9 million dollar high school as of September 1970. The specific training areas and equipment are now functional in anticipation of future plans in the area of occupational education.

Mr. Prioli is the director of Occupational Education for the Brockton Public Schools, Brockton, Massachusetts.

What is Career Education?

James L. Boone, Jr.

Much has been said about career education since Commissioner Marland first broached the subject before the National Association of Secondary School Principals a little over one year ago in Houston. President Nixon devoted a considerable portion of his recent State of the Union message to the specific subject of career education. The American Industrial Arts Association and the American Vocational Association have put task forces to work on career education position papers. In spite of all the attention that career education has received (or perhaps because of it), there still seems to be some confusion concerning the meaning of the term. This is to be expected, of course, since the concept of career education is still in a formative stage. Even Commissioner Marland cannot describe the shape that it will take when (and if) career education becomes an accomplished fact. He is counting on people like you and me to create portions of the over-all program.

What then is career education? President Nixon said, "Career education is not a single specific program. It is more usefully thought of as a goal—and one that we can pursue through many methods. What we need today is a nationwide search for such methods—a search which involves every area of education and every level of government. Career education can help make education and training more meaningful for the student, more rewarding for the teacher, more available to the adult, more relevant for the disadvantaged and more productive for our country."

In the November 1971 issue of American Education, Commissioner Marland stated, "In any event, what the term 'career education' means to me is basically a point of view, a concept—a concept that says three things: First, that career education will be part of the curriculum for all students, not just some. Second, that it will continue throughout a youngster's stay in school, from the first grade through senior high and beyond, if he so elects. And third, that every student leaving school will possess the skills necessary to give him a start in making a livelihood for himself and his family, even if he leaves before completing high school." Now, isn't this what school is supposed to be all about? It seems to me that Dr. Marland is telling us that it is high time that we achieve all of the objectives set forth in the "Seven Cardinal Principles" that were espoused more than half a century ago. I might add, parenthetically, that Dr. Marland did not say general education has to go, in his Houston speech. He said that general education as we know it today has to go—and I agree. A little further in his speech he was equally critical of vocational education—as we know it today.

How do others define career education? The National Association of State Directors of Vocational Education, in its position paper, says career education is "...an emerging, essential concept that will provide a viable system of learning experiences which will assist all youth to acquire useful information about the occupational structure of the economy, the alternatives of career choice, the obligations of involvement in the total work force, the intelligent determination of personal capabilities and aspirations, the requisites for all occupations, and opportunities to prepare for gainful and useful employment." The American Vocational Association takes the position that "Career education provides a unifying core for the total educational enterprise, with intensive occupational preparation as a significant aspect."

What is career education? The consensus seems to be that career education is not a single segment of education, but is a total philosophy of education. It involves the redirection of education from kindergarten through adulthood to the philosophy that the major objective of most educational activities should be to make each human being productive. This means that the curriculum of the elementary and secondary schools should be permeated with content that is related to productivity and careers. Industrial arts is one of many elements that can contribute to this philosophy. I trust that the following presentations will provide you with ideas or examples illustrating methods by which industrial arts can fulfill its role in career education.

Dr. Boone is head of the Department of Industrial Education, Texas A&M University, College Station, Texas 77843.

Implementing Career Education

Herbert Siegel

In his first major address after becoming U.S. Commissioner of Education, Sidney P. Marland, Jr., called for the abolition of general education curriculum and its replacement by career education. This is wonderful, this is great, this is what the "shop teachers" on all levels of education, industrial arts teachers from K-12, and vocational teachers have known and advocated for a long time.

Now that the policy has been established, all of us will be working toward the common goal of career education for every child in our schools. However, we must look beyond our area of specialty, and we must realize that career education must be accepted in its broadest terms, as defined by Dr. Marland. Probably the greatest challenge in educational history is now thrust upon all of the teachers in the United States.

Of the many problems confronting the advocates of career education, by far the greatest of these is to convince the academicians that education, as it has been taught for the past 50 years, has not done the job expected of it, and there is ample evidence to prove this point. Now is the time to make education more relevant, more meaningful, At last we have a U.S. Commissioner of Education who sees the futility of our present educational program and is willing to stand up and bring about the required changes, which will benefit all of our children.

NEED FOR PROMOTING CAREER EDUCATION

One of the major problems is to make the professional educators aware of career education. As a personnel survey, I have asked a number of people at the Board of Education if they were aware of the concept of career education. Much to my surprise, very few of the teachers questioned, and they included persons assigned to mathematics, guidance, and the language arts departments, have heard of career education. If this is so in such a small sampling at the Board of Education, I can visualize how this ignorance of career education will multiply outside of our schools. We must get busy and, if we believe in this concept, we must then sell it to everyone concerned, parents and educators alike.

We must stop talking to ourselves (industrial subject teachers) and talk to the remainder of the educational world. This is the group that must be sold on career education. This promotion must emanate from the U.S.O.E., from the State Education Departments and City Boards of Education. This promotional campaign must include articles in all educational publications, radio and television presentations, posters on all public transportation, and printed materials that could be distributed in quantity to schools and PTA organizations.

WHAT THE TEACHER CAN DO

As I travel around the city visiting classes, I find that each day in many of our laboratories the teachers and students are involved in good educational practices, such as field trips and visitations to industry and city museums. Guest speakers from industry are used in lab and auditorium periods. Many students are busily engaged in cooperative work programs and after-school skills training programs, and I am pleased to state that the latest educational equipment is used in teaching these programs.

A really effective program is not a "one-time thing." To implement the kind of program that will introduce our students to the world of work will demand that an effective program be in operation every day, or the student will be deprived of those experiences which will enable him to make a wise choice of a career. It is a comparatively simple matter to fall into a rut and have the students continue to work on their projects day after day. But to teach the type of career education program which I know that all industrial teachers are capable of requires a determination and zeal far beyond keeping the pupils "busy."

What is needed is that all the teachers in a department sit down and plan a viable program for their classes; one that would include all the experiences that a student should have in a career education program. The implementation of an effective program demands the cooperation of all teachers. It behooves the teachers of industrial subjects to lend their expertise in the world of work to those teachers who only have a college background and help them plan an effective course of study.

Exploration is one of the main objectives of industrial arts education. This can be taught through project construction and instructional information lessons. The construction of projects is something all teachers undertake with enthusiasm. However, when it comes to providing industrial information, each teacher has his own concept of what this area should include.

In an industrial arts department with more than 1300 teachers, some degree of uniformity is necessary or else a chaotic situation will result in our teaching program. The lessons which appear in each of our teacher manuals indicate the special effort we make in New York City to teach career education to our pupils.

The following guidelines, as suggested in the General Metal Shop Teachers Work Manual, indicate the philosophy and general format of an industrial information lesson. Teachers are encouraged to use audio-visual aids, speakers from industry, or perhaps a field trip if these techniques would make the lesson more effective and more meaningful to the pupils. It is self-evident that these lesson plans could be developed for each industrial arts area.

5.

INDUSTRIAL INFORMATION AND INTERRELATION WITH OTHER SUBJECTS

MASS PRODUCTION TECHNIQUE

The technique of mass production is another method of bringing industrial practices into the school shop. The degree to which the basic idea is carried out depends on the resourcefulness of the teacher and his dedication to making new tracks in the wilderness.

A simple mass-produced item might consist of a project organized by the teacher, using jigs and simple operations on a production line basis. Or perhaps it could assume the aspect of a business corporation, using various committees to undertake the designing, construction of jigs, production control, production costs, financing, and merchandising.

The mass-produced project might involve one shop or it could involve the cooperation of the entire industrial arts department. The design and working drawings could be developed in the mechanical drawing room; the wood, metal, and electrical components of a project could be fabricated in their respective area shops; the publicity and product promotion could be handled in the graphic arts shop. In other words, we have at our disposal the facilities to bring into our program a real-life industrial situation. Here is one way of introducing pupils to industry and at the same time revitalizing our program.

The following flow chart and descriptions are copied from Mass Production Unit, Scrolled Flower Pot Stand, which was developed by our teachers.

1. Planning and Research:
   a. Group meets to decide on project.
   b. Project is based on tools, equipment, materials available, and consumer needs.
2. Purchasing:
   a. Materials needed, cost, where to purchase material most economically.
3. Sales and Merchandising:
   a. Students obtain administrative permission to visit classes during the homeroom period to make their sales pitch and to take orders.
   b. Display and advertise the product in the G.O. store and in the school paper.
4. Production Planning and Jigs:
   a. Prepare working models for the sales department.
   b. Make jigs for mass-production work.
   c. Plan time-saving features.
   d. Make a preliminary run to test for problems.
   e. Prepare assignments for individual workers.

Interrelation of General Metal Shop with Other Subjects

[illegible]

Mathematics

Problems in the costs of materials and tools
Reading the rule and other measuring devices
Computing metal measurements and weights
Mathematics related to the reading of a rule
Making a bill of materials and figuring costs
Properties of a circle
Changing fractions to decimals and decimals to fractions

Art

Working drawings
Pictorial drawings
Original designs
Interpreting working drawings
Freehand drawing
Mechanical drawing

Language Arts

Books dealing with industrial arts
Pertinent articles in magazines
Oral and written reports
Spelling
Technical terms used in industrial arts

Social Studies

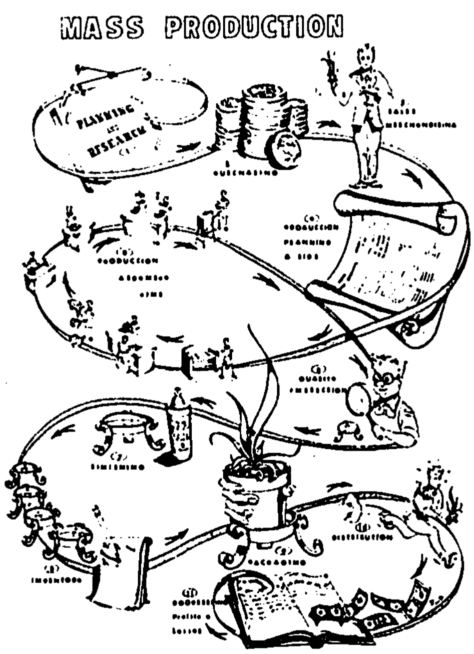
Sources and conservation of metals
Sources of other raw materials
Manufacture of related materials
History and development of tools
History and development of metal products
Proper attitudes and necessity for cooperation with fellow workers
Economy in making home repairs
Mass production
Trade unions
Technological changes in the metal industries
Occupational Information
  General education and physical requirements for employment
  Local opportunities for employment
  Metalworking as a hobby: home workshops, tools and operations
  Future of the metals industries

Consumer Values

Selecting and buying metal products
Knowledge of metal
Knowledge of metal construction
Functional use of metal furniture
Value of a name in a manufactured product

Science

Structure of metals
Rust and corrosion
Friction and lubrication
Metal alloys



5. Production Line:
   a. Mobility of moving project along the assembly line.
   b. Reason for the worker to do the same job to acquire time-saving skills.

6. Quality Inspection:
   a. Necessity for the product to meet minimum standards. The inspection area can be placed before or after the finishing area.

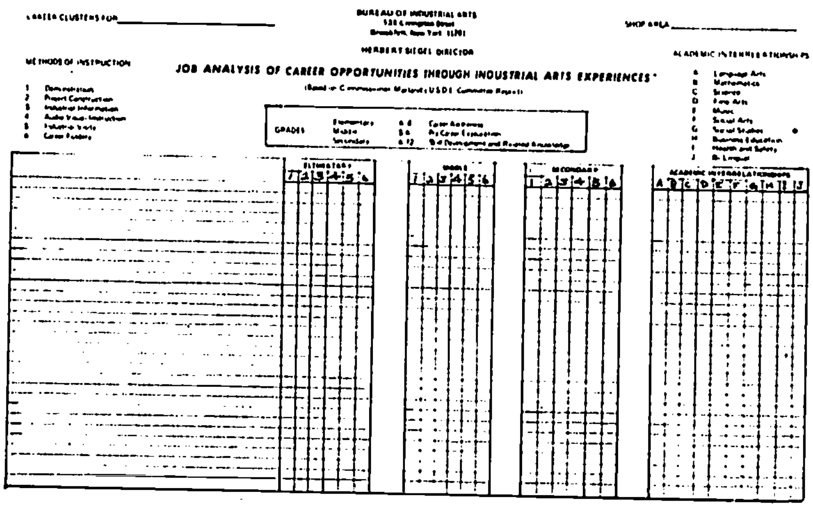
7. Finishing:
   a. Spray paint.
   b. Brush paint.
   c. Dipping.

8. Packaging:
   a. Add flower pot with plants.
   b. Slip cast flower pots if a ceramics unit is available.
   c. Cover with cellophane and ribbon for eye appeal.

9. Inventory:
   a. Make sure all orders can be filled within the time limit set for this unit.
   b. Set a production goal to avoid overproduction.

10. Distribution:
    a. Arrange with homeroom teachers for delivery of the product.
    b. Prepare receipts for money collected.

11. Bookkeeping:
    a. Keep all bills and records of purchases.
    b. Record new orders.
    c. Record deliveries.
    d. Figure overhead and labor costs.
    e. Calculate profits or losses.
    f. Profits donated to the school G.O.
    g. Close the books.


CAREER CLUSTERS FOR ____________

BUREAU OF INDUSTRIAL ARTS

Brooklyn, New York 11201

HERBERT SIEGEL DIRECTOR

SHOP AREA ____________

METHODS OF INSTRUCTION

JOB ANALYSIS OF CAREER OPPORTUNITIES THROUGH INDUSTRIAL ARTS EXPERIENCES*

ACADEMIC INTERRELATIONSHIPS

1 Demonstration
2 Project Construction
3 Industrial Information
4 Audio Visual Instruction

A Language Arts
B Mathematics
C Science
D Fine Arts
E Music
F Social Arts
G Social Studies
H Business Education
I Health and Safety
J Bi-Lingual

GRADES: Elementary, Middle, Secondary

	ELEMENTARY						MIDDLE						SECONDARY						ACADEMIC INTERRELATIONSHIPS									
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	A	B	C	D	E	F	G	H	I	J

JOB ANALYSIS OF CAREER OPPORTUNITIES THROUGH INDUSTRIAL ARTS EXPERIENCES

We are undertaking a thorough study of what we are doing to teach career education in our industrial arts labs. Upon completion, this analysis will be followed by a definitive report as to what each teacher should be doing to foster career education. It will also indicate the academic interrelationships of each job and should prove helpful to the academic teacher in planning his work, so that there is complete educational integration.

Using the 15 career clusters designated by Dr. Marland's committee, we have prepared a form which will help us to determine exactly what we are doing and what methodology is being used to achieve each goal. We have retyped all of the job designations on these forms and provided for an evaluation of what is being done on the elementary, middle, and secondary school level.

To begin with, two industrial arts supervisors were assigned to each industrial arts area taught in our middle schools; these are wood, metal, graphic arts, electricity, and ceramics. Two supervisors were also assigned for the elementary schools, and then the industrial arts chairmen in secondary schools were assigned to evaluate their labs. These include wood, sheet metal, machine shop, graphic arts, electricity, drafting, plastic, and transportation. Each was requested to indicate which academic subjects had a relationship with the job under discussion.

This will be a tremendous job; however, we all realize that if we are to put the career education program across, it will require a great deal of effort on the part of the individual teacher.

We must also extend a helping hand and guidance to the many teachers who have not realized the true significance of career education beyond their own specific experience.

Mr. Siegel is Director of Industrial Arts, New York City Schools.

Career Education—A Role for Industrial Arts

Kenneth R. Clay

Career education—currently, no concept or term in education is being bandied about, discussed, defined, and analyzed more than this. National impetus has been given to this movement by U.S. Commissioner of Education, Sidney P. Marland, Robert Worthington, and President Nixon who, in his recent State of the Union Message, indicated that: "Too many of our students, from all income groups, have been 'turning off' or 'tuning out' on their educational experiences.[1] He indicated that he felt one reason for this situation was the inflexibility of our educational system, including the fact that it so rigidly separates academic and vocational curricula. He further suggested that we need a new approach and that he believed the best new approach is to strengthen career education.

Dr. Marland has further stated that: "Education's most serious failing is its self-induced, voluntary fragmentation. The most grievous example of this is the false dichotomy it makes between things academic and things vocational," and, I would add, practical. Dr. Marland has suggested that "all education is career education—or should be." He has proposed that a universal goal of American education be "that every young person completing his school program at grade 12 be ready to enter either higher education or useful and rewarding employment."[2]

It becomes clear, I think, that career education is not a new program to be added on to our already overburdened and fragmented curriculum. Instead, it is a total philosophy or concept of what education ought to be. Each course, program, or other educational offering should have a stake in contributing to an individual's development and career preparation.

To achieve this end will require changing many attitudes and the reorganization of our total elementary and secondary school programs. Obviously, this is going to take much time and effort before such a goal can be achieved. However, we do see a number of promising developments. New Jersey, like Florida and New York, represented by other panelists, has, I believe, made a major commitment to the implementation of the broad-scale concept of career education. But, before I indicate some of the specific developments and programs in New Jersey, let me attempt to set before you four basic elements which I feel must be a part of any comprehensive career education scheme.

ELEMENT ONE—TECHNOLOGICAL LITERACY

Provision must be made to include:
- --An examination of past technological developments and their impact on our society.
- --The development of an understanding of things mechanical and technical.
- --The development of an understanding of the relation of technological development to the development of knowledge.
- --An opportunity to apply basic concepts and principles in a practical setting through hands-on experiences.

ELEMENT TWO—OCCUPATIONAL AWARENESS

Provision must be made to include:
- --An understanding of the worth and function of man's work in our society.
- --An understanding of the world of work.
- --The development of one's self concept and recognition of the dignity of work.
- --Individual experiences that relate and contribute to eventual career choices.
- --An examination of career possibilities, growing out of and related to any subject or field of study.

ELEMENT THREE—CAREER EXPLORATION

Provision must be made to include:
- --Examination of occupational opportunities and projections.
- --Identification of various occupational requirements.
- --Simulated experiences related to various career roles.

--Exploratory, manipulative, classroom, and laboratory experiences in a wide range of career clusters.
--Situations and opportunities where students can develop an understanding of their interests, attitudes, aptitudes, abilities, and skills as they relate to career choices.

ELEMENT FOUR—CAREER DEVELOPMENT

Provision must be made to include:
--In-depth testing of tentative career choices.
--Increased self-understanding and awareness, particularly as related to various careers.
--Development of some specific job skills.
--Provision for actual selective work experience opportunities.
--Employment orientation experiences.

These four basic elements—technological literacy, occupational awareness, career exploration, and career development—I see as essential ingredients in any comprehensive career education program.

Since 1966 in New Jersey, several specific programs have been developed which contain some of the elements and provisions which I have just enumerated. The Technology for Children Project, as it has been called in New Jersey, was developed in 1966 through the able leadership of Dr. Robert Worthington and Miss Elizabeth Hunt. This project has grown and is now found in some 250 different schools, involving 6,000 students. Utilizing a hands-on, multi-media, multi-sensory approach to learning, the Technology for Children Project aims to integrate technological activities and academic studies as an aid to children to develop a better understanding of their roles in a technological society. In addition, an appreciation of the role of technology in our society and the world of work is also developed. This K-6 enrichment program provides an educational climate where students accept work as a necessary and vital function of human endeavor. Students are introduced to such concepts as product design and development, properties of materials, mass manufacturing, instrumentation, quality control, material storage, inventory and control, sales and distribution, to mention but a few.

Some activities that have been included are: building and launching model rockets; testing various materials; setting up an assembly line and mass producing a product; writing and printing a paper; designing electrical and electronic circuits; developing, operating, and maintaining a profit-making business; producing a TV show; visiting construction, manufacturing, and distribution enterprises; and many other varied activities.

Another program that was developed in the late sixties was the Introduction to Vocations Program. This program is designed to provide a broad base of occupational awareness for students at the middle school and junior high school level. Exploratory, manipulative, classroom, and laboratory experiences are offered in a wide spectrum of occupational clusters and, combined with the resources of business and industry, assist the student in the development of more realistic career plans. The goals of this program are:

1. To assist youth to develop an awareness of career opportunities.
2. To provide realistic hands-on experiences, field trips, talks with experts in various fields, and the opportunity to gain occupational information through a variety of media.
3. To better prepare students to make wise course selections in their school program.
4. To enhance the student's ability to do occupational planning that is sequential and commensurate with his abilities, interests, and opportunities.

Evaluations of the program have shown that many students have gained success and self respect, developed more realistic goals and self concepts, and made wiser course selections and long-range plans because of their experiences in the program.

These programs which I have described were distinct efforts to bring about greater awareness on the part of students of the technological society we live in, the world of work, occupational awareness, and the development of one's self-concept and self-realization. However, the charge of fragmented educational programs which Dr. Marland has stressed is equally applicable to these programs and other efforts.

In an attempt to place a concerted effort on the development of an integrated total program of career education, Governor William Cahill of New Jersey, with bipartisan legislative support, introduced a bill into the New Jersey Legislature early in the fall of 1970 to set up a pilot career development program in three large cities—Camden, New Brunswick, and Rahway. The bill, which became law on November 19, 1970, carried with it a supplemental appropriation of $318,000 to finance what has been called Governor Cahill's Career Development Program in these three model cities. This Career Development Program, which runs from elementary school through high school, facilitates the training of teachers and provides for educational career opportunities for students. It exercises a new and more effective approach for learning which combines technical activities and academic classroom lessons designed to provide occupational awareness with regard to career opportunities.

This pilot program, which provides a new approach to learning for all students, includes the following components:

TECHNOLOGY FOR CHILDREN

INTRODUCTION TO VOCATIONS

SUMMER COUPLED WORK STUDY

This phase of the program opens laboratory and academic classrooms during the summer months and offers students a variety of experiences combined with actual work experiences in the public sector.

JOB PLACEMENT

This phase of the program is designed to fulfill the obligations of education to provide placement opportunities for all students and particularly for those who are employment-bound directly from high school.

CAREER RESOURCE CENTER

A career resource center is established in each school district to provide, for both teachers and students, a wide variety of instructional materials and media relating to occupations of all kinds.

IN-SERVICE TEACHER EDUCATION

In each of the pilot districts, teachers who are currently employed in the elementary, middle, junior high schools, and senior high school receive in-service training to prepare them for a teaching role in the Career Development Program. Although this comprehensive, integrated program has just entered its second year, results have been most favorable. An increased level of funding, in excess of $700,000, has been obtained from the Legislature to continue and expand the program.

Two additional cities are being added to the project—Newark and Asbury Park. Several other large comprehensive school districts are moving to implement similar programs on a K-12 basis on their own.

In addition, as many of you may know, the Hackensack, New Jersey, School District has been named as one of the six school districts in the United States to test the "school-based career education model" recently proposed by the United States Office of Education.

As I see it, what we really need is a partnership approach in education to bring off and obtain the goals and concepts of career education that are being espoused. Such a partnership, as exemplified by some of the programs which I have mentioned, must include all subject fields in our school programs at all levels, including pre-school and early childhood education, elementary, middle school, junior high school, senior high school, post-secondary education, and continuing education. Included in this partnership must be teachers, administrators, students, parents, teacher educators, curriculum specialists, State Department of Education personnel, business, industrial, and community leaders. Only with such a partnership and joint effort will it be possible to bring about the total revolution and reorganization that will be required of our school programs.

Industrial arts, as we know it today, has no larger or lesser role to play in career education than any other discipline or program in our current school curriculum.

Certainly, because of the body of knowledge contained in the field of industrial arts, we can make a unique contribution to many of the elements of a sound career education program which I have described. Because of the expertise the field of industrial arts has achieved in assisting students in studying technology and its relationship to man, society, and the world of work, we can effectively contribute to the development and expansion of what I have called each student's level of technological literacy. Certainly, many of the activities normally found in quality industrial arts programs provide the student with the opportunity to increase his occupational awareness and explore, through practical hands-on experiences, various career possibilities. The possibilities are limitless. All it takes is imagination, innovation, commitment, and a genuine concern to assist students.

I would also place the same challenge, however, before every other subject area in the school curriculum. Certainly, students studying English, history, science, and other subjects should have an opportunity to examine and become familiar with various career possibilities that grow out of these and many other disciplines as they are studying these particular subjects.

I have indicated that a partnership approach will be required to achieve the projected goals of a comprehensive career education program. Let me close by citing an example of where a partnership approach is being proposed and developed. Glassboro State College, in cooperation with the New Jersey State Department of Education, an entire city school system (Vineland Public Schools), business and industry, parents, students, departments, and teachers at the local school level and college level, is in the process of developing a total systems approach to career education which could have far-reaching implications.

This proposed program is conceived as a five-year effort which, for the first time that I am aware of, would bring representatives from all departments in a teacher education institution together with public school personnel in a joint effort to attack head-on implementation of the concept of career education K-12 in a city-wide school district and, at the same time, modifying teacher education programs, both pre-service and in-service, to properly prepare teachers for new roles and responsibilities. We, at Glassboro and in New Jersey, are enthusiastic about this effort and hope that we will receive the necessary support to bring off this monumental task.

Let me close by saying I think it is time that we, in industrial arts, bury the hatchet and assist in breaking down the artificial boundaries and walls which have existed between industrial arts programs, vocational education programs, and other curriculum areas in our schools. As I indicated earlier, we have a stake and role to play, no greater or no less a role than any other curriculum area, in bringing about the transformation and realization that our school programs must more effectively assist students in developing technological literacy, obtaining occupational awareness, exploring various career possibilities, making career choices, and effectively preparing for a career—be it one which requires additional education beyond high school or direct entry into the world of work.

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Dr. Clay is Vice Provost for Academic Affairs at Glassboro State College, Glassboro, New Jersey, and also serves as Vice Chairman of the New Jersey Advisory Council for Vocational Education.

Elementary Career Education in Dade County

Ralph Ressler

Dade County, like so many other school systems across the nation, is responding to the U.S. Office of Education's call for "career education." Our effort which began several years ago with disadvantaged groups at the junior high school level has now reached into the elementary school. It is here that awareness of career opportunities and what people do for a livelihood should be learned—as you know, the career selection process begins at approximately ten years of age and is based in part on previous experiences and knowledge concerning the world of work.

PRINCIPLES OF CAREER EDUCATION

I believe that our direction in Dade County holds meaning for industrial arts education—especially at the elementary and junior high school levels. Although there are several points which might be referred to as "principles of career education," there are three which I wish to bring to your attention.

Comprehensiveness of Career Education

Career education is a multidisciplinary program. It not only affects all subject areas, but also must provide students with awareness of the total realm of career opportunities. All students must come in contact with representative careers, whether the 15 clusters of the U.S. Office of Education are used or another system. The sole purpose served by the clusters is to insure such comprehensiveness in career education.

In addition, we must approach career information from the standpoint of teams of people who work together or through the idea of looking at careers associated with themes or topics. The "career ladder" concept should be reserved for late secondary education.

Career Education is Supplementary

At this point in time and at the elementary level especially, career information and the career emphasis must be assimilated into the various on-going classroom subjects and the teaching which occurs as a matter of course daily in the elementary classroom. It cannot take the form of an appended course, additional units of study, or an added responsibility of the classroom teacher to the point where it becomes a burden as such.

Career Education Should be "Try-Out" Based

Not only the elementary level, but the entire career education program should be based upon actual try-out experiences. Whether a laboratory is available or not, even the elementary student must be provided the opportunity to try out a real "career task" (a typical task required of a specific career, such as making a presentation like this which might be considered a career task of a college professor). Such experiences must begin with role playing in kindergarten and culminate with internship or trial work experience in the senior high school. Activities associated with student interest clubs and Junior Achievement are valuable. Gaming will have to be used for the more abstract career tasks.

There are other perhaps more subtle premises which career education is based upon, such as teacher training, community involvement, and the like. These three, however, its comprehensiveness, supplementary nature, and being based upon try-out experiences, are of particular interest to this group.

TWO-PRONGED APPROACH

We are making a two-pronged effort in Dade County, based upon short-term goals. You might note how the three principles stated earlier are applied here. One approach is for elementary schools without the availability of laboratory facilities—essentially a classroom effort. The other is related to the use of laboratory facilities similar in concept to those in industrial arts education.

THE CLASSROOM

First, the classroom effort. Dade County has 167 elementary schools, the vast majority not having laboratories as such.

Earlier this school year one of our five districts, which has 27 elementary schools, participated in a workshop in which supplementary learning activity packages were produced.

Teachers in teams of two (a primary and an intermediate teacher) produced learning activity packages structured about themes or topics, some of which were "Who Helps Us Fly," "People Who Build Homes," "Who Keeps Us Well," and so on. The packages written about the theme were referred to as "topical" packages, and these were produced at both levels, primary and intermediate (a total of 40).

For each career touched upon in the topical package, a mini-pack was made for further use by an interested child. In all, 178 packages were produced—approximately 100 careers are noted.

These were edited so they are all fairly consistent in format, illustrations are being added, and they are being typed at this time. They will be printed later this year and field tested in the Fall of 1972.

To permit their efficient use, these packages will be accompanied by an indexing system, the 178 packages having been indexed for reading level and the appropriate unit for which they would be best used.

The key part of a learning activity package, of course, is the learning activity itself. With input from vocational teachers, such activities were oriented toward "doing" experiences related as realistically as possible to associated careers.

THE CAREER CENTER

The second effort taking place concurrently with this is associated with what we are referring to as "career centers." These facilities will offer students the opportunity to try out specific, real career tasks representing more than 130 careers. Each is being field tested with supplementary software in two pilot schools at this time.

The try-out activities themselves have been selected using the following criteria:

1. Their Representativeness: the activity must be a first-hand, real career task—not a pseudo or "second hand" one if at all possible.

2. Time Consumed: the activity must consume a minimum of time for the student to complete (the reasons for this are to bring more activities to more students and to keep the students' focus upon the career, not the process).

3. Success Quotient: the activity must insure a high degree of success, at least in part—various ability levels must be considered: reading, manipulative, and motor skills, etc.

4. Space Requirements: the activity should not consume an inappropriate amount of space when compared to the average activity.

5. Cost Factor: the activity cannot be so costly that it is not feasible to support in the average school.

6. Safety: obviously, it must be safe for children to do.

There are additional criteria of lesser importance, including teacher training required and so on, which we do not have time to discuss.

Our concept of career education facilities also includes the possibility of utilizing classroom career centers and school centers which may be associated with appropriate "natural" centers (health near the dispensary, office occupations in the central office area, and so forth) as well as the career center laboratories themselves.

In the career center laboratories, we are planning for an elementary teacher to work hand-in-hand with a practical arts instructor and aide to supervise the 20 or more students who may be in the career center at any one time. Each student will come to the career center on a scheduled basis to perform his particular career task with the help of self-instructional material. This software will guide him through the particular activity with a minimum of supervision.

The student will, for example, enter one of the two career laboratories, pick up his instructional material, and move to his work station. He or she will then begin the task, perhaps initially with the instructor's guidance, and continue until it has been completed. He may be required to wear a uniform such as a dentist's smock or a hardhat all the while, depending upon the activity itself.

When he has completed the task, he may take a few minutes to observe other students involved in various activities, then leave as another child arrives to try the same activity.

The responsibility on the part of the classroom teacher will remain high with a career laboratory, for she must interject career information into her classroom instruction using learning activity packages, for example, and when appropriate give selected students material associated with classroom studies which refers to the try-out activity available in the career center. The student, of course, may or may not be interested in trying it!

The articulation of try-out experiences from role playing in the primary grades to career center experiences in the intermediate grades through experiences in exploratory courses at the junior high school which place the student in a career role and on into the high school where such opportunities increase dramatically and eventually include actual work experience is extremely important.

SUMMARY

These, then, constitute our two initial steps to implement career education in the elementary schools of Dade County as soon as possible. Quite obviously, there are other aspects of a total career education effort which include visitations, interviews, parental involvement, teacher in-service training, and more. The elementary curriculum itself must still develop the self-awareness basic to career selection, must still build basic skills for students, and must still acquaint them with various aspects of the world and of the society in which they live. We feel, however, that career education will actually help in these endeavors—not hinder. Industrial arts can play as big a role as any other subject area—perhaps bigger, if an effort is made now to begin to teach students industrial processes from the viewpoint of the careers associated with each; in short, to emphasize the career as opposed to the process.

The administration in Dade County has recommended that career education, including career centers, replace separate industrial arts and/or home economics facilities.

The role industrial arts educators will play, however, will expand, and the junior high school program will grow in importance as a result of this elementary experience.

Career education is truly an opportunity for all educators to make a significant impact on the future of our students.

Mr. Ressler is Director of the Lindsey Hopkins Occupational Center, Miami, Florida.

The Cluster Concept in Career Education

William Alexander

One of the gross misconceptions in American secondary education today is the idea that students should be counseled into the general academic or college preparatory curriculum "just in case" the opportunity arises to go to college. And if it doesn't, there is always the vocational area which can prepare one for some type of job. Society as a whole seems to perpetuate this type of pedagogical class structure with small regard for the impact of the nation's dynamic and growing industry and technology.

Commissioner Marland commented on this problem in a recent address delivered to the National Association of Secondary School Principals:

> I want to state my clear conviction that a properly effective career education requires a new educational unity. It requires a breaking down of the barriers that divide our educational system into parochial enclaves. Our answer is that we must blend our curricula and our students into a single strong, secondary system. Let the academic preparation be balanced with the vocational or career program. Let one student take strength from another. And, for the future hope of education, let us end the divisive, snobbish, destructive distinctions in learning that do no service to the cause of knowledge and do no honor to the name of American enterprise. (1971, p. 4)

Marland further adds that "youngsters should be given the opportunity to explore eight, ten, a dozen occupations before choosing the one pursued in depth, consistent with the individual's ambitions, skills, and interests." (1971, p. 6)

Vocational programs for the '70s and '80s should be based on a broad cluster concept of skill development rather than the traditionally narrow trade training programs presently operating in the public schools.

The Report on Manpower Requirements, Resources, Utilization, and Training by the U.S. Department of Labor states:

> Whatever one concludes about the merits of broad versus occupationally oriented education, it is clear that the occupational curriculum offered at high school and post-high school levels should be expanded. These curriculums should be based on the "broad cluster" concept, as a part of broad-based education, to permit both the opening of more options than are now available and the prospect of career ladders in these options. (1968, p. 28)

Another interesting comment in this area appeared in the U.S.O.E. publication Education for a Changing World of Work.

> Basic vocational education programs should be designed to provide education in skills and concepts common to clusters of closely related occupations. The curriculum should be derived from analyses of the common features of the occupations included. These students should receive specialized or more advanced vocational training later in post-high school programs, apprenticeship, or on-the-job experiences. (1963, p. 227)

A DEFINITION

The career cluster concept holds that occupations may be classified into logically-related groups on the basis of identical or similar elements. The cluster concept in vocational and technical education provides for the organization of interrelated groups of industries or occupations into "families," "galaxies," or as the term implies, "clusters," which have identical or similar problems, skills, and knowledges.

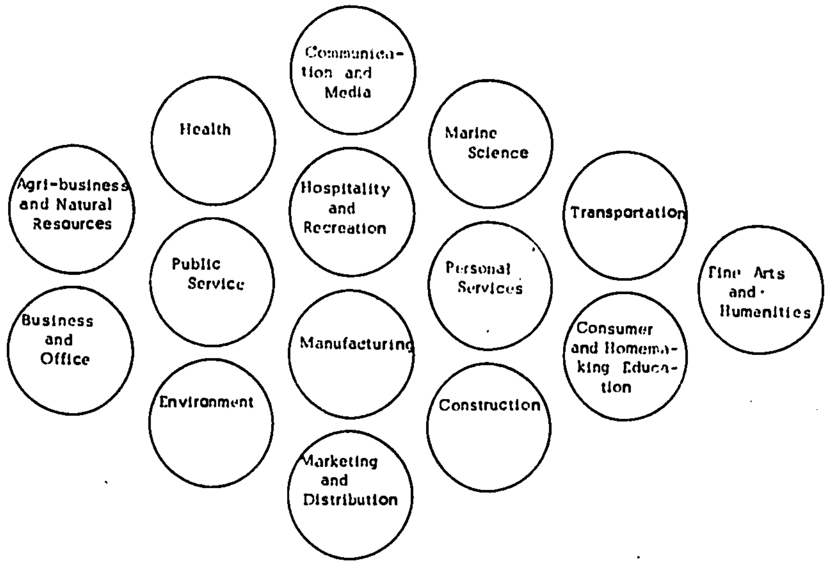
Several attempts to identify clusters have been made based on various criteria. For example, "clusters" may be derived from different dimensions; i.e., by similarities in job environment, hourly pay or wages, educational requirement, psychomotor tasks, levels of skill requirements (low skill, semi-skilled, high skill), and so on. The dimension most commonly used in developing clusters is the similarity in trades or occupations. These "occupational clusters," as they are called, group families or galaxies of occupations having a high degree of overlapping tasks and related knowledge.

Some examples of clustered occupations reported in the literature are health occupations, food service, accounting and bookkeeping, electricity and electronics, transportation, construction, personal services, and communications.*

The Bureau of Adult, Vocational, and Technical Education, U.S. Office of Education, has recently identified and codified 15 occupational clusters for use in career education. See Figure 1.

FIGURE 1: OCCUPATIONAL CLUSTERS FOR CAREER EDUCATION

(from DHEW booklet CAREER EDUCATION 1971)



*Sources used for identification of occupational clusters are the Dictionary of Occupational Titles (U.S. Department of Labor), Classified Index of Occupations and Industries (U.S. Department of Commerce), Alphabetical Index of Occupations and Industries (U.S. Department of Commerce), and the International Standard Classification of Occupations (International Labor Office, Geneva, Switzerland).

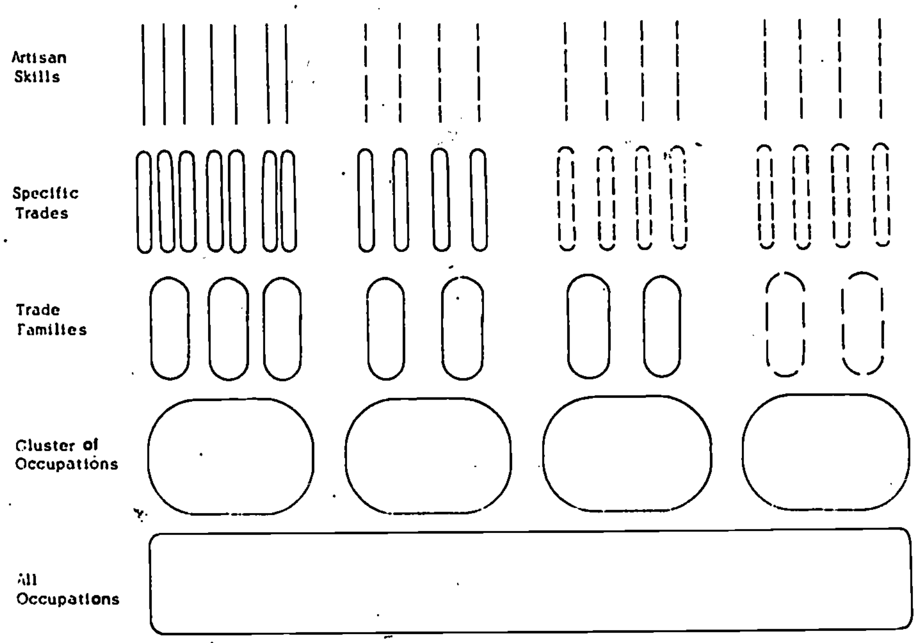
A basic premise for the cluster concept is that students may be trained in a core of skills common to a number of related occupations rather than focusing directly on a specific trade as is traditionally done. Furthermore, related information from science, physics, math, communications, and social studies is identified and incorporated into the planning of clusters to provide a more meaningful and articulated curriculum for students pursuing vocational programs.

Individuals who have been exposed to training under a vocational cluster concept have much more opportunity for occupational transfer and adaptation of knowledge, upward mobility within the cluster areas, and a better understanding of the world of work and their role in it.

The cluster program is not conceived as a means for developing master craftsmen in any given trade, but rather to provide opportunities for developing job entry level skills and some second level skills in related occupations. Figures 2 and 3 show graphic models of the interrelationships of clustered occupations, trade families, specific trades, and the artisan level of master craftsmanship. This pyramidal concept allows pupils to explore more fully the range of occupational potential and to develop at least entry level skills in several occupations.

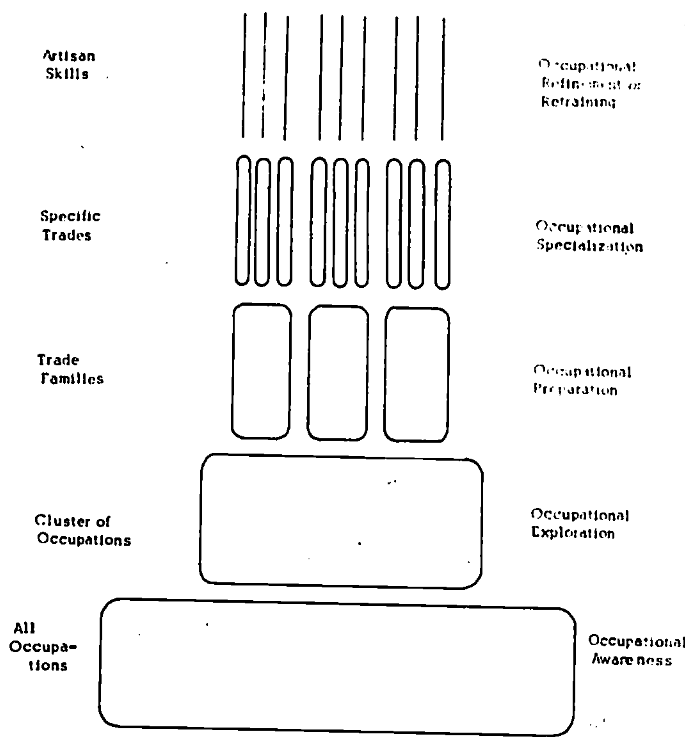
FIGURE 2: PYRAMIDAL CONCEPT OF CLUSTERED SKILLS

(from Project Career Quarterly Report, Massachusetts, 1972)



The cluster concept as an approach to career education is receiving a great deal of interest and attention in the last few years. A number of states are examining the potential of clusters in vocational education, viz., Maryland, Delaware, Oregon, Washington, and Massachusetts. There are many other states that are making efforts to establish career education programs which will most likely utilize the occupational clusters in some form or another. A few of these are: Georgia, Mississippi, New Jersey, North Dakota, and Wyoming. Very few states, however, actually have pilot research projects underway presently to develop and test cluster curriculum.

FIGURE 3: SPECIFIC EXAMPLE OF THE PYRAMIDAL CONCEPT



ADVANTAGES OF THE CLUSTER CONCEPT

There appear to be several significant advantages in the cluster concept as identified in the literature and in the current research efforts. These advantages are summed up nicely in the Report of the Committee on Labor and Public Welfare of the U.S. Senate (commonly known as the Essex Report).

> 1. To provide the student with greater flexibility in occupational choice patterns. This provides the student with an opportunity to obtain skills and knowledge necessary for job entry in several related occupations, and also an opportunity to appraise his own interests and abilities in relation to the several occupations in the cluster.
> 2. To provide the student with vocational competence that affords him a greater degree of mobility. The opportunity of mobility is seen as both geographic and on the job. The skills developed are seen as being both employable and transferrable. The student who has the opportunity to prepare in a "cluster" of occupations will likely be better prepared for technological change. Changes on the job will be expected rather than feared as in the past. (1968, p. 362)

A number of industrial spokesmen have shown that workers will most likely change occupations two to seven times during their lifetime. This fact, combined with the increasing geographical mobility of workers as well as industries, calls for a different type of occupational training. Students should be trained in a family of occupations rather than a specific trade. While there may be sacrifice in depth of skills compared to the present training programs, there is a much broader-based understanding and general skill development in a family (or cluster) approach which provides opportunity for a worker to move easily within the family of occupations, allowing him to retain the element of choice and to avoid job obsoletion and probable termination.

James Russell alludes to this point in the publication Automation and the Challenge to Education.

> ...therefore, to the extent that the school tries to develop employable skills, it should aim at transferable skills, and it should not attempt to train persons for specific jobs that are only temporarily open. (1962, p. 42)

Rumpf adds:

> Industry needs workers who are flexible, workers who have a field of skills and basic education that will enable them to adapt rapidly to occupational changes. (1964, p. 10)

In view of the changing technology in industry and man's need to adjust to these changes which have become revolutionary in many cases, some very serious questions have been raised concerning education in general and vocational education in particular. It is becoming obvious that an attempt to predict a favorable future for any narrow occupational category is sheer speculation. In fact, there is a distinct econor 'c as well as personal advantage to an individual who has been trained and is able to move successfully among several occupations. (Rockefeller Brothers Fund, Inc., 1958)

"CORING" SUBJECTS IN THE CLUSTER

The cluster concept offers numerous academic advantages to the learner. A clustered curriculum facilitates solving some of the problems related to varying academic abilities of learners, remedial instruction, motivation and incentive, meeting individual needs, and individualizing instruction. A cluster of occupations, when "cored" with what is typically called related academic subjects, can produce a most effective and meaningful learning experience. Normally, learners are routed through a daily educational experience consisting of a series of unarticulated subjects, each vying for their own supremacy while offering little or no integrating focus for learners.

Coring is achieved by first listing and analyzing the tasks essential to a given family of occupations and then identifying the basic skills, understandings, appreciations, and attitudes in science, math, communications, and social science needed for employment and mobility within the occupational family. This process ties subjects together in a meaningful pattern which should make sense to students.

IMPLEMENTING THE CLUSTER CURRICULUM

Coring subjects necessitates a close working relationship among the teachers involved. It promotes a teaming effort in planning and teaching a cluster curriculum which opens doors to many other pedagogical innovations.

One of the major considerations in implementing a cluster curriculum is scheduling. Since each cluster or family of occupations may require different types of related "academic" skills, understandings, and attitudes, as well as varying lengths of study, it becomes obvious that some type of flexible scheduling must be employed. One of the solutions to this is the modular scheduling technique. This scheme allows the latitude necessary for such diverse arrangements of students, teachers, and facilities. Modules of from 20 to 30 minutes are popular and lend themselves well to the cluster concept.

A second very important aspect of cluster teaching is the need for teachers to organize and plan curriculum materials cooperatively. This teaming effort reduces barriers between and among subjects and enhances communication among all concerned, including students. The greatest advantage, of course, is to the student, since he benefits from the combined efforts of his teachers rather than their independent efforts.

Ideally, a differentiated staffing system should be employed in the clusters to take full advantage of the professional personnel. This is one of the most logical approaches to team teaching yet developed.

A third major element in cluster programs is the diagnostic, counseling, and placement functions. It is imperative that a good testing program be used for diagnosing students' abilities. This in turn should be followed by careful counseling and placement during and after the training experience. All too frequently, students elect a vocational area based on interest without serious consideration for aptitude and specific abilities. Some students are assigned to vocational shops purely on a numerical balancing of program enrollments, and have no benefit of counseling and placement. This is often true in correctional institutions whose budgets do not allow such services and in some public schools, particularly at the early secondary level.

A valuable source of help in counseling and placement is an industrial advisory committee composed of representatives of labor, management, industrial psychology, local government, and the clergy. A team of this nature can assist in the placement of individuals and maintain the community contacts necessary for a successful program. The committee also provides important feedback and advice for improving the curriculum.

Other educational innovations which seem specially adaptable to the cluster concept are (1) dial retrieval systems; (2) programmed instructional materials; (3) individual learning packets; (4) non-grading of subjects; (5) unit organization and teaching, and, of course, (6) the systems analysis process for curriculum development.

RESULTS OF EXPERIMENTS WITH THE INTEGRATED CLUSTER CONCEPT

Research results available so far in the implementation and testing of an interdisciplinary (or integrated) cluster approach to career development programs are very scarce. Several pilot projects using clusters have been run in Maryland, Oregon, Washington, and Pennsylvania, but not much data is published as yet. Final reports on the Maryland and Pennsylvania projects are available, however, and are summarized here.

The Maryland project, whose principal investigator was Dr. Donald Maley at the University of Maryland, compared experimental and control groups in each of the following clusters: construction, electro-mechanical installation and repair, and metal forming and fabrication. Maley reports the following conclusions: (1) three out of four of the construction cluster programs showed significantly higher gain scores over the control groups on the pre-post tests; (2) no significant difference appeared in the electro-mechanical installation and repair groups (proper facilities and equipment may have affected these groups); and (3) the experimental groups in the metal forming and fabrication cluster showed significantly higher gains in post-tests over the control groups (Maley, 1969, p. 34).

A recent pilot project in the White Hill Correctional Institution at Camp Hill, Pennsylvania, compared two random vocational cluster groups with a control group randomly selected from the regular academic program. The groups were pre-tested and post-tested with forms of the General Education Development Test and statistically tested on mean gain scores. The results showed the cluster groups scored as high as the academic group in nearly all subjects. One cluster group achieved significantly higher scores in English and math than did the control group. The reverse was true only in social studies in one group. (See the Interim Final Report of the Bureau of Correction, Camp Hill, Pa., September 1971.)

It was also discovered that more residents were able to pass the GED test and receive the diploma in each of the two cluster groups than in the academic control group. These results show strong support for the interdisciplinary character of the program. In addition to this, residents in the cluster programs obtained entry level occupational skills in the trade area that was taught.

These results tend to show that a higher rate of individual success can be achieved through the integrated cluster program than in the conventional vocational trade programs presently in operation.

The few research data available on the cluster approach are very positive and generally substantiate the claims that this approach offers a more meaningful learning experience for students.

SUMMARY

In summary, there seems to be little argument on the value of the cluster concept in vocational education. Some writers have even urged adoption of cluster organization across the board in general education. (In this case, either subject area clusters or occupational clusters may be used.)

Cluster development in vocational education calls for major changes in conventional trade training programs which are criticized as being narrow in scope and inadequate in providing students with the flexibility and transferability of skills and knowledges necessary to keep pace with a radically changing technology. For a student to spend two or even three years in a current secondary school trade program usually results in a great deal of time spent in in-depth skill development which is sometimes redundant and obsolete. In many instances, the trade program simply cannot keep pace with modern industrial machinery and practices and therefore improvises with whatever is available in the school.

In view of the predictions of several occupational changes in the individual's lifetime, the trade training system we have now seems economically unsound. Industry has found it quite satisfactory for employees to have a broad-based understanding and skill development in the industrial processes used and allow the depth of technical skill to develop on the job. The reorganization of vocational training programs into occupational clusters provides a tenable solution to this problem.

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Communications

GRACO—The Design and Communications Component

Richard Swanson

"GRACO," or Graphic Communications, is viewed as the communicative dimension of industrial technology. The design and effective communication of ideas is another way of describing GRACO.

Although conceptual models of GRACO content will be presented, we are competing with no one in the realm of models of industrial technology. We choose, and sometimes merge, what we consider the best thinking of people in industrial arts, engineering, and vocational-technical education.

My major purpose is to contribute to the development of an overview of Bowling Green's philosophy of the breadth, depth, and interface of the dimensions of industrial technology that is expected of industrial arts teachers in training. In the few minutes available I shall provide you with representative student activities that illustrate the models of the two major dimensions of "GRACO." They are the design process—product and human factor and the visual media process. Here is a rather sophisticated model of the design process (Figure 1). You may ask—"What has this got to do with

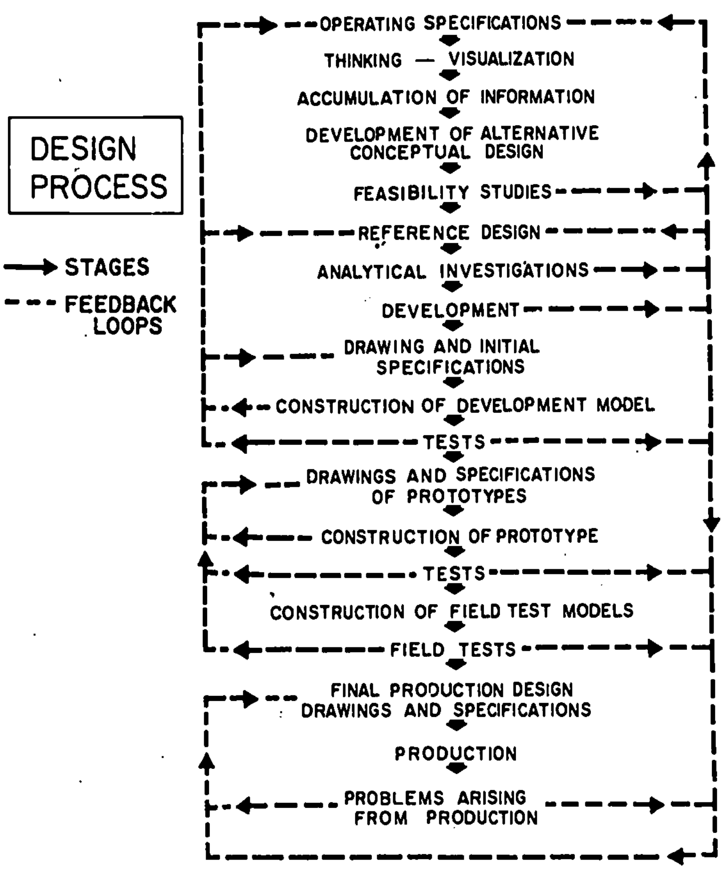

Figure 1

typical industrial arts drawing?" The answer, of course, is...."not much!" We consider the design process as "sacred," while the drawing of lines is secondary. Of course, we would like our students to be skillful at both.

In talking this through, the first stage is operating specification or customer requirements. Various stages of the product design process are creative atmosphere for thinking and visualizing, development and modeling, prototypes, test of peer criticism, and final production design.

A recent student design activity at BGSU is the epitome of the highest fidelity of product design. The Plastic House Project started out as a concern by students for low-cost housing. The library and field research revealed many new construction concepts and materials. An application investigation revealed migrant housing to be a high priority item in Northwest Ohio. By this time, there was a team of students thoroughly immersed in the project. They submitted a mini-proposal to the Department Awards and Research Committee and received $50.00 to cover costs being incurred. A comprehensive study of the attitudes and needs of farmers and migrants was made. Alternate design solutions were developed; testing of materials and modeling were also part of the effort. The students and a faculty member, realizing the worth of their initial efforts, began searching for monies to implement their ideas. The $50.00 departmental seed money matured into a formal proposal and $14,000 funding. A field test model will be constructed and evaluated. One of the undergraduate students will now become project director, while concurrently working on his Master's degree. He expects the project to culminate in a Master's thesis.

It is quite obvious that the interface with MACO and EPIC will become the dominant concerns as we move to the construction and the testing of the plastic house.

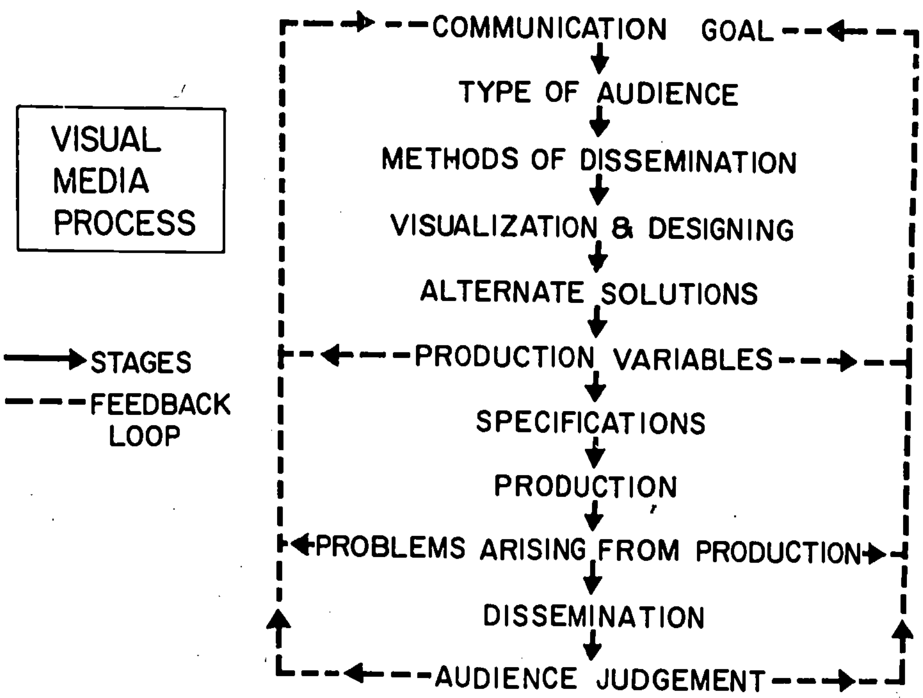

Figure 2

The second model is of the visual media process (Figure 2). The engineering analysis aspect of product design is usually scientifically cleaner than the evaluation of a media product. In the area of visual media, the consumer response is the objective. "Did I communicate effectively?" is the ultimate question. Designing and evaluating for this is more illusive than determining structured strength, etc.

Requiring students to tackle live jobs is a way of getting immersed in the media process. These "live" jobs can be identified by either the student or the instructor. Determining the communication goal and target audience becomes the first crucial learning experience for the student. What? Why? Who? Educational level? Socio/economic background? These and other questions, when answered, can drastically change a tenable media solution.

Let me cite three common student activities taking place at Bowling Green and then relate them to the visual media process; they are brochures, departmental newsletters, and three-dimensional displays.

The analysis of the communication goal and type of audience leads students to non-traditional solutions. The departmental newsletter affords a team approach. Production variables such as press and ink-distributing capacities become factors in recommending changes in the future size and layout.

What I have presented is an overview of students' activities generated primarily through the efforts of George Scherff and Gene Poor of our faculty. Although I am biased toward their work, I feel somewhat objective in assessing the enthusiasm of their students, who are deeply interested in the dynamics of technology.

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Communication: The Beginning of Understanding

Ronald L. Hoenes

Change can be considered anything that differs from what it has previously been. Desired change will most often come about only through careful planning, thinking, and acting on the part of an individual or group of individuals. For this to occur, there must be understanding among all parties concerned. The success or failure of desired or planned change will depend upon the effectiveness of communication.

Usually, when communication is the topic of discussion by a group of industrial technology educators, you can feel sure that the discussion will include "visual" communication and very possibly "electronic" communication. It is rare indeed when elements of communication such as feedback and interference are discussed. Yet these two elements along with three others—the sender (source), message, and receiver (destination)—are what communication is all about.

The primary purpose of communication is to share information, an idea, or an attitude. For this to occur, there must be at least three elements present: a sender, a message, and a receiver. Figure 1 provides a graphic illustration of these elements. The pitcher is the sender or source of the message, the baseball is the message being sent, and the catcher is the receiver or destination of the message.

However, there is more to communication than just sending a message. For communication to be effective, the sender must know how his message has been received so the necessary adjustments can be made in the message transmission. This completion of the communication cycle from sender to receiver and back to sender is referred to as feedback. An umpire has been added to the illustration in Figure 2 to provide immediate feedback to the pitcher so he may know how his message has been received.

There is still one element of communication missing from the picture. A batter must be placed between the pitcher (sender) and catcher (receiver) to try to hit the ball (message). The batter will try to prevent a good pitch from reaching the catcher; therefore, we will refer to him as interference. Figure 3 shows the complete picture of the communication process with its five necessary elements.

The chances for effective communication are greatly enhanced when the prospective communicator becomes familiar with the ingredients of communication as adapted from a model developed by David Berlo. Refer to Figure 4 as each of the ingredients are presented.

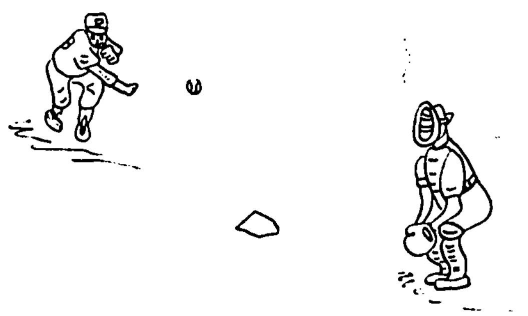


Figure 1

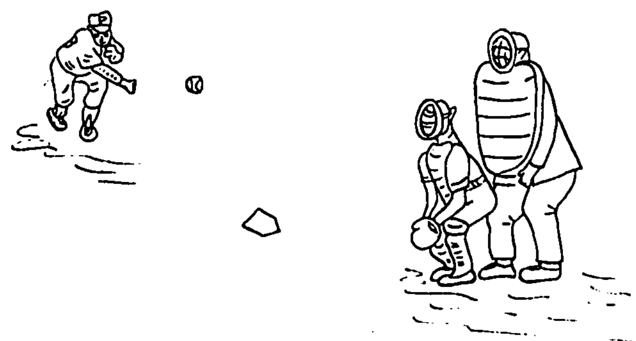


Figure 2

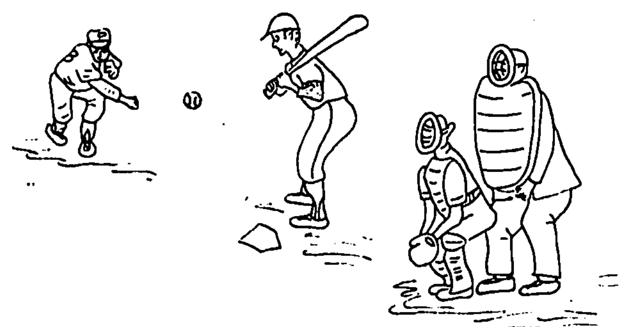
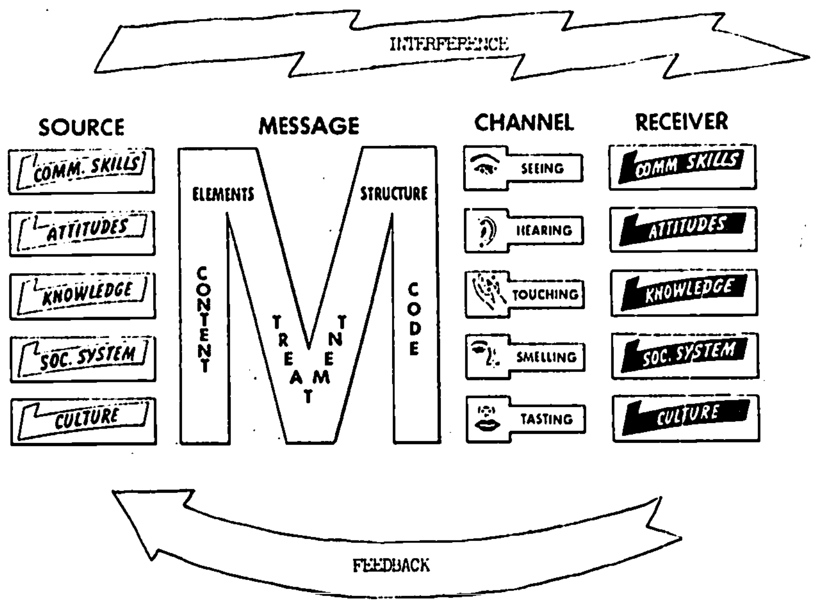


Figure 3



The Ingredients of Communication

(Adapted from original model by David Berlo in The Process of Communication)

Figure 4

SENDER-SOURCE-ENCODER

Attitudes. The attitudes of a communication sender affect the ways in which he communicates with the receiver. An attitude or feeling of confidence will carry over to the receiver in most cases, while the opposite would be true should the sender have a feeling of inadequacy in what he is doing. A positive approach will, in most cases, be more successful than a negative one.

When one offers a communication containing subject matter he is distrustful of or opposed to, this attitude can very easily carry over to his receiver. On the other hand, a strong liking for or support of the subject matter by the sender in his communication can also carry over to the receiver of his message.

Communication Skills. There are five communication skills that are essential to effective communication. Two of them are sending or encoding skills: writing and speaking. Two of them are receiving or decoding skills: reading and listening. The fifth is crucial to both sending and receiving: thought or reasoning. While other sending skills such as drawing, signaling, etc., are a possibility, what we say about writing and speaking can be generalized to the other sending skills as well.

Experience. Experience is the best teacher is a phrase that is abused and much over-used. What may be a good learning experience for one is not necessarily a good learning experience for another. An example of this is a talk on the positive merits of physical exercise for children. A member of the audience who excells in athletics would probably be a good receiver of the message, while a child who has just broken his leg in physical activity would probably have a negative reaction to your message.

Another element of experience to be aware of is personal experience. Do not make the mistake of assuming that your receiver (audience) has had the same experiences you have had. To talk about the beauty of Yellowstone National Park and make reference to specific trees, waterfalls, etc., with which you are familiar could very easily mislead your audience. If they have never traveled more than ten miles from Backwoods Junction, where the only waterfall occurs from a faucet, you could hardly expect them to visualize a magnificent waterfall many miles away. Therefore, it is essential that you are aware of the experiences of your receiver before you begin to send a message.

Knowledge. There should be little doubt that the amount of knowledge a sender has about his subject matter will affect his message. One cannot communicate effectively what one does not know, and one cannot communicate effectively material or information that one does not understand. In the same light, if one knows too much or is too technical in his communication, he is sure to lose his receiver.

Social-Cultural System. Every communicator, regardless of his status, is influenced by his position in a social-cultural system. Everyone has a role to fulfill, whether it be that of a leader or follower, a public image or behind-the-scenes operator, an intellectual or average Joe, etc. Other factors the sender and receiver must be aware of are cultural beliefs and values, forms of behavior that are acceptable or not acceptable, required or not required, his own expectations, and the expectations others have about him.

RECEIVER-DESTINATION-DECODER

The receiver-destination-decoder has already been discussed at some length when we talked about the sender-source-encoder. That which would apply for the person at the sending end of the communication would also apply for the person at the receiving end. During any answer-question session, a person would be both sender and receiver at the same time. The same would apply for the audience.

MESSAGE

The message can be defined as the physical product of the sender: verbal words when speaking, written words when writing, pictures when painting or using photography, and movements or facial expressions when gesturing. There are five factors within a message that the communicator should be aware of. They are the message: elements, structure, code, content, and treatment. Elements and structure are so closely dependent upon one another that they shall be discussed together.

Elements and Structure. Everything we do that has meaning also has structure. To structure something, we must place the elements in a meaningful order. This may sound confusing, so let us study the following example to clarify the role of elements and structure in a communication.

Each letter of the alphabet individually can be considered an element. These letters or elements must be structured or placed in an order to have meaning. The individual letters "moitcuncanoim" have no meaning, and therefore, cannot communicate as individuals. However, if we structure them to spell "communication," we now have meaning and are on our way to communicating with the receiver. Elements can grow from letters to words, where the structure would grow from a word to a sentence. In a signal such as Morse code, the elements are dots and dashes. These dots and dashes must be ordered or structured to form letters, words, and sentences for there to be meaning. The following example shows how elements and structure change as the elements become structured.

Elements	Structure
1. Individual letters	Word
2. Words	Sentence
3. Sentences	Paragraph
4. Paragraphs	Chapter
5. Chapters	Book

Code. The message code consists of any group of elements that are structured in a way that is meaningful to the sender and hopefully the receiver. Language is a code. However, a sender who uses German as the code would not communicate with a receiver who only understands English. Words can be considered a code if they are structured in a meaningful order by the sender. The strength of the code will depend upon how well the words (message) are understood by the receiver of the message.

Content. Content is the material in a message that has been selected by the sender to express his purpose. The message content in this paper consists of the assertations the author makes, the information he presents, and the judgments he proposes.

Treatment. After we select a code with which to send a message and content to make up a message, we must arrange each of these in a logical and meaningful order so the message will bring about the desired response in the receiver. This arrangement of code and content, each of which have organized elements and structure, is the treatment we give the message. It is in the treatment of a message that we use attention-getting devices, a few of which are loud colors, unique phrases, and key words—Sale, Free, Take One, etc.

Some people have become widely known through special treatments they give their messages. When one hears the tune "Thanks for the Memories," he will more than likely think of Bob Hope.

CHANNEL

In communication, the channel can be considered the vehicle that is used to carry the message from sender to receiver. The sender-source-encoder must decide how he will channel his message so his receiver-destination-decoder can decode it. In decoding, the receiver must do one or more of the following activities: see, hear, touch, taste, or smell the message. In short, we define the communication channel as the senses through which the receiver decodes a message that has been encoded by the sender.

When choosing a channel, the sender of a message must decide which of the five senses he must use to obtain the most effective and desired response from his intended receiver. We should be aware of the fact that in most cases the more senses that can be involved in interpreting a message, the greater are the chances that the message will have its desired effect upon the receiver. This means that a combination of seeing and hearing is preferred over seeing or hearing alone. Seeing, hearing, and smelling would be preferred over seeing and hearing, etc.

FEEDBACK

For communication to be effective, the receiver must be active. He becomes active by answering, questioning, or performing, mentally or physically, to the message. This creates a return or response loop of the communication cycle, from receiver to sender. With the completion of the circuit between sender (source) and receiver (destination), there is an increase in the accuracy of the information (message) transmitted. This completion of the circuit is termed feedback. Feedback enables the originator to correct emissions, errors, and possible misunderstandings in the transmitted message, to improve the encoding and transmission process, or even to assist the recipient in decoding the message.

An example of feedback occurs when a number of people in the audience become drowsy or go to sleep while the speaker is talking. Seeing these people acting like this lets the speaker (sender) know that he is not communicating effectively to the entire audience. He knows that he must make some adjustments to interest or motivate these people in what he is saying. On the other hand, when the audience as a whole responds to the message as the speaker had hoped they would, this response is the feedback that lets him know he is communicating effectively.

INTERFERENCE

In almost every communication there exists a strong possibility of something being present that will prevent the message from reaching the receiver or being interpreted properly. This "something" is termed interference. Interference is any disturbance that obstructs or distorts transmission of the message. The element of interference can have serious impact on the success or failure of a communication. A hot room can be considered "interference" when people are trying to listen to someone speak. The use of ambiguous words by the speaker will create "interference" with the audience because they do not understand what is being said. A loud noise or static on a radio broadcast is an example of interference. Ambiguous or misleading material in a motion picture can be deemed interference. Past experiences by the receiver that conflict with the message being sent can create internal interference on his part.

In summary, we have briefly touched upon the many parts of an elementary model of the communication process. While a great deal of information has been introduced to you, the reader, most of it is not new but has been and will continue to be used by everyone who has reason to communicate with someone else. What I have done is to analyze and place in its proper context each element that makes up the entire communication process. An important point to keep in mind is that communication is a process of putting all of the ingredients—sender, message, receiver, feedback, and interference—together with careful planning and thought, before there exists the possibility of effective communication or the beginning of understanding.

No matter what methods or materials a communicator may use, he or she must answer the key questions: Did the audience (receiver) interpret the message as he meant for it to? Did they react as he desired? The answers to each of these questions will be determined by how well the communicator understood each concept of communication and how well he applied them in his communication.

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Idea Communication in Drafting

Joe W. Walker

The primary function of engineering drafting skills is the communication of ideas through graphic representation. Standardized symbols, notes, views, and arrangements are used to convey a description of the most simple, as well as the most complicated, component of every production item from the abstract thoughts of its designer to the skilled hands of its maker. A basic understanding of the drafting skills used in this medium of instruction is necessary before an idea may be fully transmitted or received through the use of drawings.

If the purpose of attaining drafting skills is to be able to produce a drawing that transmits an idea, then the teaching of such skills should be organized to constantly reflect this purpose. The teaching of the manipulative skills of drafting has been widely accepted and perpetuated as a separate entity, irrespective of the purpose of drafting as a whole. The "typical" course in engineering drafting is divided into units of study, with a working drawing assigned near the end of the semester to provide application of previously learned skills. The literature provides numerous ideas for methods of teaching within the framework of the unit approach, but guidelines for restructuring the approach are conspicuously absent.

In a survey of course content for college drafting, Blum[1] indicates that beginning drafting courses in the 142 institutions contacted identified eleven specific units of study which comprise the content. They are Drawing Equipment and Materials, Sketching, Lettering, Applied Geometry, Orthographic Projection, Dimensioning, Sections and Conventions, Revolutions, Auxiliary Views, Screw Threads and Fasteners, and Pictorial Drawing. The implication is that these units were being taught as separate entities, which could be combined for practical application. This survey would indicate that the typical college-level course in drafting is taught by the unit approach.

Several writers attack the approaches used in many drafting courses and offer their suggestions for change. Auer[2] and Rowlett[3] condemn meaningless repetition in drafting assignments, and Wright suggests that problem-solving techniques would more closely emulate industrial practices than "copying line work exercise from the nearest book on engineering drawing."[4] Tischler[5] proposes that a conceptual approach should replace comprehensive study of engineering drafting.

If drawings are used to communicate, and if what they communicate is ideas, then the logical approach to teaching drafting should be one that teaches the communication of ideas. The approach should be directed solely toward learning to communicate through graphic representation, rather than learning the many aspects of graphic representation first, then applying a few of the skills to produce one or two working drawings.

Complete working drawings are the standards by which the student's knowledge and understanding of drafting should be judged. If every technical aspect of a drawing is perfect, and it fails to get the message across to the person who is to use the drawing, it is worthless.

The major objective of drafting course should be to develop within the student the ability to communicate an idea through graphic representation. All other objectives and activities of the course should be directed toward the attainment of this goal.

With respect to the implementation of idea communication, the term must be analyzed for its component parts and then instructional procedure developed to fit the analysis. This is the same procedure which resulted in our present typical drafting course; however, the primary objective dealt with the component parts of what constitutes a drawing. It is easy to see that a drawing is comprised of lines, geometric construction, orthographic projection, pictorial views, section views, etc.

If we analyze idea communication, the first thing we recognize is working drawings. Each working drawing is unique and therefore presents its own problems. A problem-solving approach, which analyzes each object to be drawn with respect to what does this object do and what features need to be described in detail, structures the drawing.

It is obvious that a beginning student would not be capable of asking these two questions and then producing a working drawing of an automobile carburetor. His first assignment might be an oilstone, a spacer block, or any very simple object. As he inspects an oilstone, he can see that its shape, size, and composition are all that is necessary for a complete description. His first attempts at illustrating this rectangular object may be directed or non-directed, depending on the teacher's preference. In the discussion of the drawing with the class, the use of orthographic projection, pictorial views, and dimensioning are real and useful, rather than units of study separated by long periods of time interspaced with examinations, Christmas holidays, and a new girl friend. The succeeding assignments should be carefully selected to necessitate the acquisition of additional drafting skills.

In a recent study on the Southwest Texas State University campus, a study compared the acquisition of general drafting knowledge of a group of students who were taught by the traditional unit approach with another group who were taught by an approach utilizing a series of working drawings. Both groups were given a short introduction to the use of drafting equipment. The control group followed the traditional approach of units of applied geometry, orthographic projection, pictorial drawing, dimensioning, screw threads and fasteners, sections, and auxiliary views. The experimental group made working drawings of an oilstone, a cold chisel, a lathe face plate, a file, a wrench, a picture frame jig, a bench rammer, a wall plaque, a bird house, a motor mount, and the shaft assembly of an automobile water pump. Both groups then made a working drawing of an automobile connecting rod, which was scored by an independent jury. The group which was taught with a series of working drawings performed slightly better on the final assignment than did the group which followed the traditional approach. Mean gain scores from pre-post tests indicated that the experimental group also gained as much general drafting knowledge as the group taught by the traditional unit approach.

This study is reported only as a means of removing some of the fears that drafting knowledge must be sacrificed in order to employ the idea communication approach. If we are going to teach students to make drawings that communicate, then we should structure the drafting courses around that goal and attack the problem head-on.

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Air Brushing in High School Drafting

W. P. Faver

What is air brush illustration? Where does it come from? How is it used? To what extent can high school students master the use of an air brush?

These are a few of the questions that we will try to answer. First let us look at some samples of air brush work. Now let us look at some air brush work by an outstanding illustrator. (Samples were shown and an explanation of the steps taken from the engineering drawing to pictorial to air brush drawing and finally to the printed copy.)

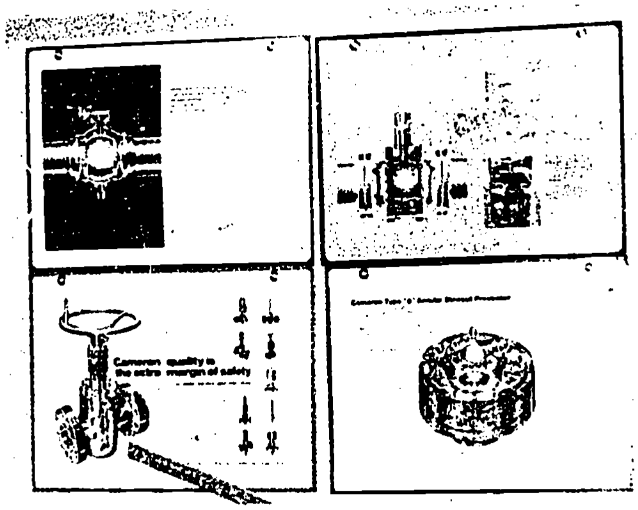

Figure 1. Some examples of professional air brush work.

Next let us look at some student work. (Samples of illustrations by 9, 10, 11, and 12th grade students from Cy-Fair High School were shown.)

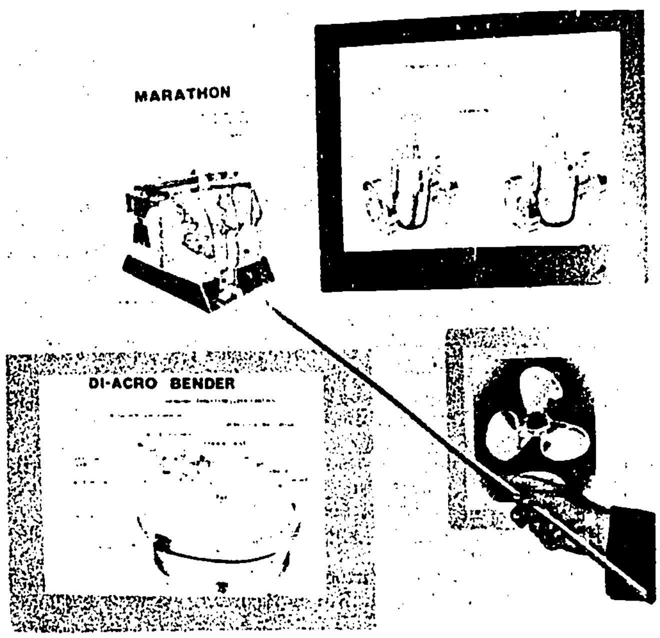

Figure 2. Some examples of air brush work done by students at Cy-Fair High School.

Now let's find out how the air brush works. (A demonstration by Geral Fauss, drafting teacher, Cy-Fair High School.)

Figure 3. William Faver explains the procedure while Geral Fauss demonstrates the use of the air brush.

Interested persons attending the session were shown how to use an air brush and given a chance to try their hand at the art.

The professional illustrations shown were by L. G. Whitfield, Houston, Texas. Student work was by the following students from Cy-Fair High School: Becky Norris, Penny Fusilier, Ricky Nickerson, Mike Koester, Freddie Cantu, Buddy Hays, Mike Chase, and Rickie Albers.

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Curriculum

Working Industrial Education Classrooms in the United States

Russell P. Kellogg

A sabbatical leave was granted to me for the year 1968-69 to travel the United States visiting between 30 and 50 schools. After my correspondence with the people whose names appear later in the report, I found that I would plan to visit about 70 schools. It turned out that a few that I had planned to visit did not get visited, but others were suggested along the way so that when the journey was over, I had accomplished what I set out to do—I had visited 70 schools.

The purpose in visiting these schools was four-fold, namely:

(1) to see what new types of industrial arts were being taught and how we could improve our curriculum by either adding to or deleting from it.

(2) to find the newest types and various kinds of building for elementary, junior high, and senior high school buildings, thinking how we could incorporate them in our building program.

(3) to study the middle school concept as it was being used in the east.

(4) to visit various schools using individualized instruction, ungraded, continuous progress education, or individualized prescribed instruction, however called and however used.

In presenting this paper, I would like to take you folks on an imaginary airplane flight across the country, back and forth from north to south, so you can visit with me some of the schools that I had the opportunity to see. The first school that I would like to talk about is the one and only school that I saw that had industrial education in the elementary grades. It was in the Nova Elementary School, Blanch Forman School, at Fort Lauderdale, Florida. This is one of the schools in the Nova Complex. They have one room where the classes come to do the things that they would like to do. They have wood working equipment, equipment that they can bake with; anything concerning the World of Industry, the world of living is taught there in this one room by one man who has the classes come to him.

Two middle schools will interest you. One that is a little different is the Brady Middle School at Cleveland, Ohio. Here, the sixth graders spend part of their day with one teacher and move as a class to art, music, library science, and health-physical education. The seventh grade students spend the major part of the day with the math-science teacher and language-social studies teacher. The balance is departmentalized. The eighth grade student follows a completely departmentalized program. The aim here is that the student gradually shifts from the child-centered program of the elementary school to the subjects of the high school.

Don Smith was the instructor of the Brady Middle School industrial arts section when I visited. Two major concerns in the curriculum planning brought about the development of this restructured industrial arts program in the Brady Middle School: to offer a series of courses that were truly a study of our industrial society and to meet the needs of the middle school age student. Other considerations were also used in developing this program:

1. to develop a course suited to all students, regardless of a specific talent.
2. to make courses as interesting and exciting as possible.
3. to stimulate and strengthen creative thinking and problem solving at all times.
4. to develop a flexible enough framework to allow for industrial and class needs while maintaining a consistency in the program.
5. to maintain a maximum of class time devoted to practical use of tools, machines, materials, and ideas.
6. maintain a program which will fit into the existing school organization and demand no more than its fair share in scheduling, finances, student preparation, time etc.

Mr. Smith set up six objectives for this course which were similar to the objectives of other courses: the culture objective, the technical objective, consumer objectives, recreational objectives, the occupational objectives, and the social function.

In the seventh grade, there was a brief study of orthographic and pictorial drawings, then an orientation exercise in the use of hand tools and machines. Then about eight weeks were spent in the historical study of technology, where they studied tools, machines, power, weapons, construction, transportation, and communication. They took different items from one of these areas to study in depth, including a research paper, a written report, an oral report, and the construction of a model. In the last seven weeks they used industrial materials and processes such as wood, metals, plastics, ceramics, and the graphic arts.

In the 8th grade, Mr. Smith had a curriculum which used roughly 9 weeks of mass production, followed by industrial design for 9 weeks. In this, each student was required to design or to invent something which would solve a problem, pose a new product or concept, or exercise his inventive ability in a mechanical way.

There were three forms that these projects could take: an experiment, a scale model, or a prototype. Mr. Smith found that he could add a fourth—small mass production, and that is exactly what he did. He tried to hold his program as set up so that each student could work according to his ability after the fundamentals were covered. The three weeks of introduction were fairly rigid, but the historical study of technology and industrial materials and processes was more flexible. In the making of the models, the students learned the safety rules of the industrial arts program, tools, safety first, etc. They were allowed to use practically all the power tools in the shop in the developing of their models. When the models were displayed, the research papers were displayed also, showing step by step what the student had done and what he had learned from making his model.

In this program, the sessions were almost equally divided between mass production and industrial design; if one was a little longer or shorter, they came out balanced pretty well at the end. Some of the students' products were salt and pepper shakers, plastic candlestick holders, book ends out of wood and plastic, plastic plaques, and plastic salad tongs.

After nine weeks of mass production, they moved into the design area. This is an advance over what they did in the 7th grade, when the student solves a particular problem.

The principal of the Brady Middle School said that their records showed that 88 to 92% of their students were geared for college education.

The plan of the Fox Lane Middle School of Mt. Kisco, New York, is widespread. There are three academic houses, the East, South, and the West. The center facility consists of a three-story building, the entire top floor of which holds the unified arts program. On the second floor, half is for music, a little theater, and practice rooms; the other half is a carpeted library with 11,000 books. The lower floor has administration and health areas and an educational media center.

The Unified Arts Program in this school is a striking departure from conventional practices. Its goal is to bring each student to an understanding of the interrelationship of design, technic, and materials. All students, boys and girls, work in an open studio containing equipment appropriate for work in textiles, ceramics, foods, wood, graphics, metal, design, and crafts. This building is octagonal in shape, and the whole top floor in this Unified Arts Program has no divisions except for two stairways and a place set aside for the office planning for the five teachers who teach in this area. They meet every day to talk with each other concerning the program that is going on for each student. It is a wonderful school to visit. If you have the opportunity, be sure to do so—Mt. Kisco, New York.

Another very interesting middle school is to be found at the Tower Heights School at Centerville, Ohio. It is planned so that most of the students going from one area to the other walk through the library area so that they are constantly in touch with books as they go from one area to another.

The middle school facilities here were designed specifically for the changes which the unknown educational future will bring. An atmosphere is created which encourages teachers to be flexible, to adapt, and to make use of worthwhile educational innovations. Instead of arranging the students to fit an inflexible building, they can continually rearrange the building to suit the needs of the students. The teachers work together in teaching teams with individualization of instruction for each student as their goal.

In this school, I was informed that the instructor did all of the work on the large power tools. Somewhere in their philosophy, they decided that students at this age were not ready for them yet.

In visiting the junior high schools across the country, you might like to investigate the Maryland Plan introduced by Dr. Maley, the American Industry Plan, and the Industrial Arts Curriculum Project from Ohio.

The school using the Maryland Plan which I visited was the Rolling Crest Junior High

School in West Hyattsville, Maryland. When I visited, this high school was under the direction of Donald A. Kiah, principal, with W. Harley Smith as leader of industrial arts. They are putting together a very good program with the Maryland Plan.

In this plan, the emphasis is on the psychological and the sociological needs of the individual as well as his resourcefulness and capabilities. In developing this program, Mr. Smith used the unit approach.

Three units were considered: Tools and Machinery, Power and Energy, and Transportation and Communication. He used a similar type of orientation to his classes. Each student contracted to explore and to study elements of the unit. In reporting to the class as a whole, each student gave one progress report, then a final report. Evaluation sheets were kept on these reports. During the year, notebooks which were kept were divided into five sections: drawings, notes, reports, lessons which were handed out by the teacher, and a bibliography. As in many classes, some notebooks were better and fuller than others, but it was evident that Mr. Smith had a chance to use a pretty good individualized approach to the subject matter.

The 8th graders took on a contemporary study of the industry. This included an in-depth study of raw materials, processing, industry, and an in-depth study of high-volume-production industries. He used a group progress approach here also. The students organized a company to form a group-produced project. In 1967 and 1968 they had a paper company and a petroleum company. The models of these companies that they had built were out in the main entryway to the building. They were excellent.

In the 9th grade there was an increased depth study of modern industry and contemporary technology. This was more personal, selected according to the student needs and informational objectives. They used contemporary units, research and experimentation, group projects, line production, and technical developments. This can be either individual or in group.

Now, go with me to the Industrial Arts Curriculum Project in Austin, Texas, where Mr. Lloyd Goldberg teaches in the O Henry Junior High School.

The first course set up for upper 7th graders is called The World of Construction. In the 8th grade, it is the World of Manufacturing. The first year that The World of Manufacturing was used was 1968-69, the year of my trip. In going through some of the schools, I found that they were getting a little slow start, but they were sure that it would really go by the time they got into it.

In visiting the school at Austin, I was interested to read the comments of one of the contractors there in their paper, <u>The Constructor</u>: "Construction industry may get some future tradesmen or foremen as a result of this program. We may even get a contractor or two, but this isn't really important. What we will definitely get are citizens with just a little better understanding of the construction industry and the contractor's problems, citizens who may someday need a contractor."

When I arrived in Austin, they were just completing the unit and were wondering what to do with the models that the boys had made. It ended up that the parents had become interested, and the fathers had decided to purchase them the following Saturday.

When I visited the Cecil DeMille Junior High School in Long Beach, California, they were reviewing manufacturing—the production of rubber—making rubber balloons. They were doing a good job, and I found it very interesting.

From my observation of IACP, I found the thing that was handicapping the schools was the lack of space to do the work that they would like to do in the program. They hope that in the future they will be able to overcome that by putting more boys on a project.

While visiting the Nova High School, Fort Lauderdale, Florida, I spent some time with Mr. Lawson who was teaching the American Industry Program there. In this program, if you will recall, the 14 major concepts of industry that they have identified are communications, transportation, public interest, finance, physical facilities, research, purchasing, industrial relations, marketing, management, production, materials, processes, and energy. Mr. Lawson said that, in their programming, the major concepts have been broken down to show a substructure of minor concepts. They believe that this conceptual teaching of American Industry will provide a firmer basis for a dynamic curriculum. Mr. Lawson was working with three classes in American Industry; one class was making name plates for teachers, pupils, etc., to place on the desks. Another class was making modern psychedelic posters, and one was assembling and selling the Nova High School calendars that the graphic arts department had made. These classes were working as an industry under administration, production, and marketing. These concepts were broken down into parts, and the students were playing their respective roles very well. They were enthusiastic about the role as president, superintendent, foreman, worker, etc. They sometimes had more than one role to fill.

The instructors in this type of program must of necessity have a large resource supply from which to draw. Students do not make projects to take home. Because of this, it takes a good instructor to challenge and maintain a high interest level in the class. There must also be more flexibility on the part of the teacher. He has to introduce more variety in this type of teaching than has been typical in most industrial arts classes.

I have picked a few junior high schools across the country to give you some typical examples. One is the Penn Junior High School in Bloomington, Minnesota, south of Minneapolis. This is a very interesting junior high school with unit labs in electricity, woodworking, metal working, machinery, metal lab.

They if we jump over and start down the east coast, we look into Stratford High School in Stratford, Connecticut. They have a graphic arts program, a good machine shop, lots of tools in it, different machinery. I liked the fact that there is enough space to have armed chairs for the lecture time. They have another unit shop of woodworking, quite large, where the students are able to make a number of things. Then, in their vocational section, in their mechanics, they have an excellent lab with good modern equipment and a few drafting machines, but most of them are just drafting tables.

The woodworking projects that are made in the Bunnell High School at Stratford are all quite similar. Practically all the students have to make the same three items before they can make the next three. They have to do with furniture making. They then have a section of the metal class that makes barbeque tools and equipment.

There is much storage space for their completed projects.

When I visited there, they had no electricity, though they wished to get it. The trend was to the side of vocations rather than industrial arts.

In Danbury, Connecticut, I found an interesting school. The industrial arts lab was quite small, not very large classes. It contained a couple of lathes, the regular tools usually found in an industrial arts lab, but the program was not very large for industrial arts. They were using pine, with furniture-making as their background for the students. I saw little individual designing. There was a metal shop, and here they did have electricity; not a very large lab, but pretty well equipped. In the drafting room there was one drafting tool. There was a good section in graphic arts with printing presses, one of the largest sections that I saw in Connecticut.

Moving over to Philadelphia, I take you to North East High School, a very large school. The vocational teachers were recruited from industry, and very few were certified teachers, but they were taking college courses to certify themselves. Furniture-making is important in this area, also.

A novel portable tool holder on each table at North East had four block planes, try-squares, marking gauges set in the center of the table for easy access, but removable when they wanted to use the whole table.

The graphic arts section was quite large and handled a class of 30 or 35. In the machinery area, I saw many lathes. In the auto mechanics area, I saw three cars lined up in stalls with the students working industriously on them. All the familiar tools were on the walls in the woodworking section.

The second school visited in Philadelphia was the George Washington School. Here again, they had a very excellent machine shop, excellent graphic arts section, woodworking, etc.

Down the coast, I went to Cocoa, Florida, another place where vocational education was being used to advantage. I went to a class in distributive education which was just getting ready to go out in the afternoon to work. The teacher was instructing the class to go out. Here, they had a man who was interested in masonry out of industry. They were building the walls for the student center, and when it was completed, the school was going to put the roof on for them.

Now on to Nova High School at Fort Lauderdale, Florida, a campus-type school. It had a good electrical section, with an excellent man there who was working on organs as well as other basic electrical problems. He had several organs there for the students to work on.

In the graphic arts section, several technicians were on duty besides the instructor. There were three drafting rooms together or, if they took the dividers from the three rooms, they had one large one.

In the testing area, they had a small testing room for metals, but it had some very nice equipment in it. Here again, we find little industrial arts but fine vocational interest.

In choosing the high schools down through the center of the United States, I would like to use a chart to tell about them, comparing them with each other.

	Draft.	Elec.	Wood	Metal	Machines	Graphic Arts	Auto Mech.
Escanobe, Mich.			good	good	good	good	
Waupaca, Wisc.	good		small	small			
Fond-du-lac, Wisc.			good	good			good
Milwaukee, Wisc.	good	good	good	good	gaod	good	good
John F. Kennedy, Minn.	good	good	good	good	good	good	
Osseo, Minn.	good	good	good	good	good	good	
White Bear, Minn.	good	good	good	good	good	good	
McPherson, Kans.	good	.		good			
Andrews, Texas	good		good	good	good	good	
Sahuarito, Ariz.			small	extra good	good		good
Mesa, Ariz. Westwood		good	good	good	good		good
Tucson, Ariz. Palo Verde	good	good	good	good	good	good	good
Phoenix, Ariz.	good	good	extra good	good	good	good	good

The storage cabinets in the wood lab of the Alhambra High School in Phoenix, Arizona were excellent. Tools were right where you needed them. There was a revolving holder on the lathes, and a complete cabinet under the extension of the saw table. A large 4-sided cabinet around a center post held all the small electric tools, spoke shaves, try squares, routers, skill saws, etc. The labs in electricity, metal, etc., had storage spaces comparable to the wood lab.

Our trip would not be complete unless we visited the Northwest. The Occupational Versatility Program is making a fine impression in the Highline and Renton School Districts. This program is in the junior high school area. Complete individual instruction is the keynote here—an excellent set-up for individual work with all the latest media: loops, pictures, tapes, etc., at the students' disposal.

The Juanita High School in Kirkland, Washington, is a very unique set-up all by itself. It is open-concept in its design, with an area as large as six football fields. The applied arts (industrial arts and art) are separated from the open area by glass walls, but they are open to students from other classes who need to use the facilities. It is too new to evaluate yet, but an exciting place to teach. We hope you will visit it in 1974.

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Developing Technical Competency Standards

L. Dean McClellan and Robert Hanson

The critical shortage of teachers prepared to accept vocational positions is rather significant. However, measuring the product (the student) of many vocational courses against the needed entry level competencies for various occupations is an atrocity that should give those of us associated with vocational education little pride. The teacher in many cases is not the only individual who is to blame. Advisory committees are of some help to the teacher in reflecting the needs of a particular occupation or cluster of occupations. But what form of guidance is provided state-wide for teachers who would like to teach up-to-date tasks that represent various occupations?

The individual states have an obligation to provide curriculum guides that identify truly representative tasks of those occupations that have needs for entry level employees. Preparation of curriculum guides cannot and should not be the responsibility of the teacher. The teacher, it is true, must remain current with technological change and the effects this change has upon occupations he is instructing. However, his time is at a premium, and many occupation-related decisions can effectively be made for him through carefully developed state curriculum guides. Lack of articulation state-wide is not surprising, since similarities between school offerings are coincidental and often are not the result of uniform guidelines.

Nebraska, as an example, has lacked coordinated curricula throughout its vocational offerings. It has never provided curriculum guides to aid the teacher in his selection of the competencies needed by Nebraska business and industry. Research to determine the levels of technical competency necessary for entry level employment in Nebraska became a reality in 1971 with the funding of a research study initiated at Kearney State College.

The "Technical Competency Standards" project for Nebraska has identified the following major objectives:

1. Identify competencies upon which Nebraska can base a coordinated state vocational T&I curriculum.
2. Develop curriculum guides for T&I related occupations.
3. Conduct workshops to aid implementation of curriculum guides.
4. Develop credit transfer (articulation) between high schools, post-secondary schools, and four-year institutions.
5. Develop competency tests and procedures for evaluating technical competency.
6. Develop teacher education curricula for priority T&I occupations.
7. Field test and evaluate curriculum guides.
8. Develop media to compliment curriculum guides.

The initial stages of development in the research effort called for identification of the most pressing employment needs of Nebraska, insofar as T&I was concerned. A research effort over the past three years sponsored by the Nebraska Research Coordinating Unit to identify the employment needs of Nebraska provided data to select those vocational trade and industrial occupations that were found to have the most critical need. A report entitled "Occupations Outlook Handbook" (in Nebraska) has been printed for the years 1969-71 which compiles the results of those studies.

The developmental efforts began by selecting 24 trade and industrial occupations for this research effort. The staff selected one cluster of occupations entitled Building Trades as the model. The development of procedures for data collections, interviewing, curriculum guide format, and evaluation used in development of the model have become the blueprint for the generation of all subsequent clusters. One occupation within the building trades cluster, carpentry, was selected as the "model" within the model. Carpentry, then, became the pilot occupation which was developed to the completion of a state curriculum guide. The pattern of development used to generate this curriculum guide has been followed on each of the building trades occupations and will be repeated throughout the development of each remaining curriculum guide.

Since articulation was one of the major objectives of this project, a meeting of representatives from each four-year institution, vocational-technical college, and several high schools in Nebraska was held at Kearney State College to inform these educators of the tentative plans and procedures that were to be used in this study and to solicit their suggestions from the outset. This meeting was held before one month had elapsed on this project so that input from these school representatives might actually provide guidance for this developmental effort. This group was asked to provide the researchers with names of outstanding trades people throughout the state with recognized expertise in the identified priority occupations. This list of tradesmen was used to randomly select those individuals that have become jurors.

The jurors for a particular occupation were mailed a "laundry list" of competencies compiled from other curriculum guides, text books, and research studies. They were asked to check each competency found in the list as to whether it was or was not a competency needed by an entry level worker. They were also instructed to add those competencies that did not appear on that list. Three jurors participated for each occupation.

Analysis of each laundry list received from the jurors was completed and a card deck was developed with one competency typed on an individual card. These cards were used in personal interviews with three individual respondents with the intention of verifying the tasks identified by the jurors. The respondents' group was made up of a tradesman, a foreman, and a teacher (when one could be found who instructed in that occupation). These individuals were asked to sort the cards into two piles, necessary or unnecessary, concerning entry level tasks for workers in that trade. The results of these card sorts provided the competencies or tasks around which the curriculum guides were developed.

The tasks found in the curriculum guides represent only the cognitive and psychomotor domains of learning. This in no way should convey the notion that the affective domain does not have a place in a vocational course. Each guide has directions placing the responsibility for selection of appropriate affective content upon the teacher. Thus, content that deals with attitudes, work habits, and guidance, for example, will be determined and effected by the instructor.

Curriculum guides contain a listing of reprints available from the U.S. Department of Labor taken from the "Occupational Outlook Handbook" which describes individual occupations for guidance purposes. An up-to-date bibliography is also included within each guide. The guide's usefulness has further been enhanced by the inclusion of a sample lesson plan which reflects a competency found within that specific guide.

This summer, a two-week EPDA institute has been planned which will instruct carpentry teachers in the use of the Nebraska Carpentry Guide. The purpose of this institute is to insure proper guide utilization during the first year. Evaluation by teachers using this guide will be carried out during the first semester of the 1972-73 school year. Teachers who have participated in this institute will provide feedback as to the relative effect and value of this prepared material. Institutes of a similar nature are proposed for all curriculum guides as they are needed.

Close cooperation with the Nebraska State Department of Education has been a reality throughout this developmental effort. Curriculum guides generated as a result of this project will unify vocational education on a state-wide basis. State Department personnel can then evaluate and fund those courses which include the competencies found within the guides.

A proposal for project continuation has been submitted for funding beginning June 1, 1972. The following Occupational Area Clusters will be completed during Phase II: Metals Occupations, Automotive Occupations, Electronics Occupations, Electricity Occupations, Drafting Occupations, and Graphic Arts Occupations.

The third phase of the project, planned for the 1973-74 school year, will include the development of the last Occupational Area Cluster entitled Service Occupations. An overall evaluation of the research project is also planned for Phase III.

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Statewide Implementation of Contemporary Curriculum

William H. Kemp

During the past decade, a great amount of curriculum research was conducted in the field of industrial arts. Many innovative programs were developed, and as a result our field has taken on an exciting, interesting new look. Unfortunately, the majority of our elementary and secondary school industrial arts programs—not to mention teacher-education programs—have shown little evidence to reflect that they are even slightly aware of these developments. Our problem seems to be to determine how we can effect curriculum change at all levels of instruction and on a broad basis.

My colleagues on the panel will discuss initiating change in specific secondary school systems, and I will discuss initiating change at the secondary level on a statewide basis and the implementation of curriculum research at the college level. My interest in these two aspects of my presentation stems from two events which have taken place in Minnesota recently and with which I have been closely affiliated. The first is concerned with the revision of our state curriculum guide, and the second is the restructuring of St. Cloud State College's industrial arts teacher-education program. I should like to discuss each of these with you in the context of statewide implementation of contemporary curriculum.

In December of 1969, a committee was formed to revise the seven-year-old A Guide for Instruction in Industrial Arts,[3] which was already felt to be outdated. I was appointed to be a member of this committee. For more than two years, study and work has progressed to provide a curriculum guide for the industrial arts teachers of our state which will incorporate the best of what has been discovered by the researchers of our field.

With this background information provided, the purpose of this presentation can more specifically be stated as being two-fold. First, to present to you what we have included in our forthcoming state curriculum guide for K-12, and second, to show you what our college has done to tool up for this change so as to prepare future teachers who must implement the content of this guide.

One of the things the curriculum revision committee did in preparing the guide was to call in several leaders in the field who had been doing research on curriculum. We had gentlemen such as Willis Ray, Paul DeVore, and Les Cochran come to our state to speak to us about their research projects. At one of our meetings, Les Cochran reviewed his book, Innovative Programs in Industrial Education[2] and others spoke about the subject of contemporary programs in industrial arts. Following these presentations, several of the heads of teacher education programs in Minnesota and Wisconsin were asked to explain what they were doing at the college level to prepare teachers to implement these changes that were taking place. The feeling expressed seemed to be, "All right, colleges, this is what's going on in industrial arts throughout the country; now what are you doing about it to prepare teachers for these types of programs?" Some of the colleges were definitely doing things that were in line with the new type of industrial arts, whereas others had done nothing, but were waiting for the teachers in the field to come to them to tell them what they wanted. Whenever one of our teachers in the field comes to me and asks me what is going to be contained in our new curriculum guide, the main thing that they're concerned about is the section that deals with content. I realize that this is the most important part to most people, and that things such as history, standards, and teacher's responsibilities seem rather insignificant in comparison. However, I am sure that they realize, as do all of you, that the sections that deal with philosophy, or basic premises, and the objectives are very important, as these parts give direction for the selection of content. We have divided the section on basic premises into four parts which express our philosophy regarding content, concepts, learning, and activities. This is followed by the objectives and a section which deals with implications. We feel this is important because it more or less summarizes our beliefs and suggests that if thus and so are true, then this should follow.

I must admit that we have leaned very heavily in our philosophy and objectives section of the Minnesota guide on the AVA publication, A Guide to Improving Instruction in Industrial Arts.[1] Many of the ideas that have been expressed in our basic premises section have come from this guide, and although four objectives have been established for the Minnesota guide, they very closely coincide with the five objectives that are contained in this AVA guide. Actually, it is possible that these four objectives could be condensed into three objectives which deal with industrial literacy, career literacy, and technical literacy. Consideration has been given to this possible change, and it may be that before the bulletin is finally published there will be only three objectives, dealing with these three types of literacy. In addition to the general objectives for industrial arts that will be contained in the new Minnesota guide, there will also be a section dealing with objectives at the various operational levels.

Earlier I referred to the section on instructional content, which seems to be of most interest to most people. The new concepts in content that are of concern to industrial arts are specifically aimed at closing the gap between industry and what is being taught in our schools. The new industrial arts curriculum for Minnesota will evolve from four industrial clusters. They are: construction, manufacturing, graphic communications, and energy systems. A fifth area is under consideration which may be added to the bulletin at a later date, the area of transportation.

Upon analyzing the industrial structure of our country, it becomes feasible to separate curriculum content into these four equally-important clusters. The selection of these clusters was prompted by man's industrial activities. All courses, subjects, and content are to reflect and draw from these clusters. To give you an idea of what these industrial clusters will look like in our forthcoming curriculum guide, Illustration No. 1 shows a brief outline of sample concepts which are to be contained in the area of construction. Illustration No. 2 gives a brief outline for the industrial cluster of manufacturing. Similar outlines are provided for the other two clusters of graphic communications and energy

CONSTRUCTION

Design

- Architectural
- Civil

Land Development

- Site preparation
- Utilities

Contracting

- Materials procurement
- Estimating and bidding
- Scheduling
- Inspection

Fabrication and Installation

- Foundation
- Superstructure
- Utility systems
- Crafts - wood, metal, masonry and decorating

Interior

- Design
- Decoration
- Furnishing

Landscaping

Maintenance

ILLUSTRATION NO. 1

MANUFACTURING

Research and Development

- Product
- Process
- Marketing

Design

- Product
- Process
- Equipment

Procurement

Materials

- Processing characteristics
- Storage
- Waste output

Production

- Scheduling
- Plant engineering
- Processing operations
- Quality control

Distribution

- Packaging
- Marketing
- Sales promotion
- Warehousing

ILLUSTRATION NO. 2

systems. All courses, subjects, and content are to reflect the draw from these clusters.

Three levels of experiences, activities, and knowledges are recommended for the K-12 system. The first is the elementary level, which deals with industrial implications. This level provides an introductory overview or study of technology and industry. It provides an insight into modern industry and related occupations. It must portray the role that technology plays in society as it satisfies man's industrial needs and interests. The second level is the junior high school level and deals with industrial functions. This level will provide for exploratory experiences in all essential functions of industry. Here is where the four areas of construction, manufacturing, graphic communications, and energy systems in their broad context are covered. The third level is the senior high school level, and this deals with industrial development. This level will provide realistic experiences inherent to all phases of industrial production and servicing. A wide variety of courses may be selected from any of the four clusters. This content is to be organized into quarter or semester courses of study. These courses can be specialized to include particular occupations (such as carpentry), particular materials, or a more specialized study of one of the cluster areas.

The remainder of the Minnesota Industrial Arts Curriculum Guide contains sections dealing with programs of technology and industrial education, standards for industrial arts departments, and teacher's responsibilities.

In the beginning of this presentation, I indicated that we have had abundant research in industrial arts curriculum. But, how is this implemented at the grass roots level? I have tried to indicate in my remarks thus far that one of the ways is to get states to revise their curriculum guides. Minnesota has done this. However, this is not enough, for if the prospective teachers now being prepared in our colleges and universities are not introduced to this new type of curriculum, it will never be implemented. We all know that we teach as we have been taught, but we also teach what we have been taught. Therefore, the colleges must revised their teacher-education programs.

At St. Cloud State College we have developed a new model for industrial arts teacher-education, and in the remaining moments that I have I should like to give you a brief overview of this program. In the past we have had two majors in industrial arts; one was a sixty-hour major which required a minor, and the second was an eighty-four-hour major. We have done away with both of these majors, and substituted an eighty-hour major in their place. In Illustration No. 3, you will note at the top of the outer ring that the four areas of our new Minnesota Industrial Arts Curriculum Guide are contained. Within the bold circle you find the core. This contains courses that are required by all majors, no

INDUSTRIAL ARTS MAJOR

WITH 8 CONCENTRATIONS (80 Q.H. TOTAL)

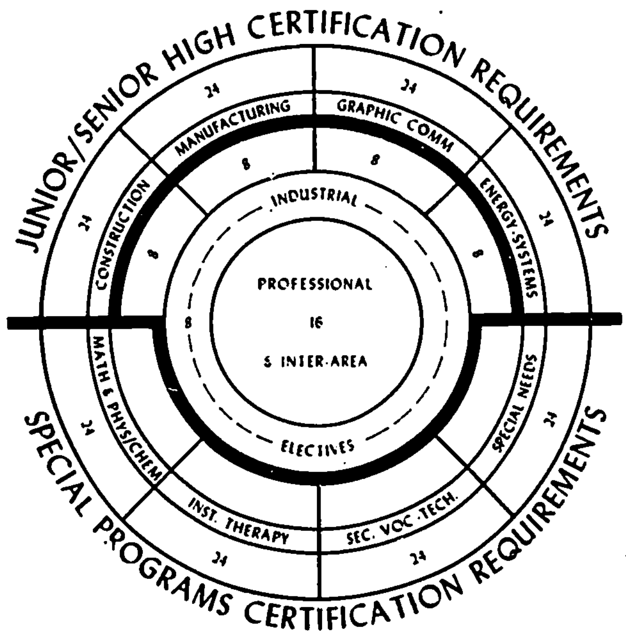

ILLUSTRATION NO. 3

matter what their area of concentration may be. The very center of the core, called the inner core, contains professional and inter-area courses: history and philosophy, course construction, methods, and laboratory planning and safety, as well as a design course and a technical math course. In the outer ring of the core, where you see the four eights, courses in each of the four industrial clusters are required for all types of majors. These are very important courses, because this is where the greatest deviation from the old traditional program takes place. Here is where we emphasize the broad industrial clusters and merge the heretofore segregated areas. For example, in graphic communications, the areas of drafting, graphic arts, and photography are brought together to show how they are truly related in the total graphic communications concept.

A person can prepare himself to become certified to teach industrial arts at either the junior or senior high school levels, or a combination of both, by taking a concentration in a specific industrial cluster and by judiciously selecting credits within the middle core, where you find the eight industrial electives. Certain courses are required for the various levels of teaching, such as innovative programs at the junior high school level.

At the bottom of the model you will find our special programs, which can be selected as twenty-four-hour options to combine with the fifty-six-hour core. The two dealing with math and physics and/or chemistry, and institutional therapy are not new to our program, and the one dealing with secondary vocational-technical teacher education is in its second year. However, the special education option is brand new. We have found that there is a great need in our state for industrial arts teachers with special education qualifications, and more and more of our students are coming each day asking to get involved in this type of program. Originally, we had intended to include a concentration in elementary education. However, after consulting with elementary leaders at the state and college levels, it was determined that rather than having an industrial arts major with an elementary concentration, to be certified in our state a person must have an elementary education major with a minor in industrial arts. We have had a minor in industrial arts for elementary education majors, and this minor has been retained to provide the necessary combination for those persons who wish to become elementary school industrial arts specialists.

In my presentation today, I have tried to show how the curriculum research that has erupted in the past decade or so can be implemented at the grass roots level. I believe that it takes cooperation between leaders at all levels of education, from elementary through college and the State Department of Education. With this type of cooperation and leadership, curriculum change will surely take place.

FOOTNOTES

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An Interdisciplinary Approach to Curriculum Improvement

John R. Ballard

During the past decade, numerous leaders of our discipline have proposed and tried out a variety of innovative ideas relative to improving the industrial arts curriculum. We should be proud of this group because they are making significant contributions to our body of knowledge, which will eventually terminate in a more viable curriculum for our discipline. If we can continue to refine our mission in schools and to get programs and practices more consistent with our philosophy as many of the research projects are seeking to do, we will be making more positive contributions to the learners in our laboratories.

ORIGIN OF PROBLEM

In the late 1950s, the state department of education in Texas, known as the Texas Education Agency (TEA), initiated a study of the total school curriculum and invited the newly-formed Texas Industrial Arts Association (TIAA) to assume a leadership role in updating the industrial arts curriculum. The association accepted the challenge; the energies expended over the ensuing three years by members of this group, which consisted primarily of classroom teachers, in planning strategies, conducting workshops, and writing curriculum materials knitted this young organization into a cohesive whole that has resulted in a vigorous professional organization well respected by the educational community in this state.

Three years of curriculum study resulted in the elimination of many needless industrial arts course titles, state adoption of textbooks for industrial arts courses, and curriculum monographs describing the nature of all industrial arts courses. But the most significant outcome of this professional experience was the contribution of the classroom teacher in bringing about these changes. He realized that due to his involvement in the study he was assisting in any impending change; consequently, he was most eager to support these changes in the classroom.

In June 1966, TIAA received another request from the TEA to provide the leadership to revise materials previously produced in the curriculum study during the 1950s and likewise to generate a set of guidelines useful for planning and constructing industrial arts physical facilities. This challenge was willingly accepted by the association, and after a thoughtful analysis of the problem by the executive committee it was decided that a new approach to the problem was more defensible than just revising the previous ten years' work. Consequently, the following criteria were agreed upon to guide the association in this curriculum venture:

1. Because of the dynamic nature of society, technology, and the learner, use an interdisciplinary approach to the problem. Sever the past and take a fresh look at what industrial arts should be for the 1970s and 1980s. Utilize contemporary research done in our field and dialogue with people outside our discipline.
2. Appoint two people (co-directors) to generate a plan to update the curriculum and write a proposal seeking funds to implement the plan.
3. Actively involve the classroom teacher in any plan adopted.
4. Make the co-directors directly responsible to the TIAA Board of Directors.

ORGANIZING FOR THE PROBLEM

A plan to update the curriculum was developed. To fulfill this plan, the study is organized as illustrated in Figure 1.

The policy coordinating committee (PCC) establishes policy and consequently is the governing body for the study. It consists of eleven members: two co-directors; chairman of each of the five working committees; a study analyst (the trouble shooter); the industrial arts consultant from the TEA; a permanent representative from TIAA; and the president of TIAA during his term of office.

The interdisciplinary committee is composed of non-industrial arts personnel to provide input into the study void of industrial arts biases. To provide input relative to industrial arts, especially from the national level, there is a committee of industrial arts leaders.

The five working committees are called rationale, curriculum, instructional materials and facilities, evaluation, and research. Each of these four-member committees will provide leadership and guidance to evolve the new curriculum for industrial arts.

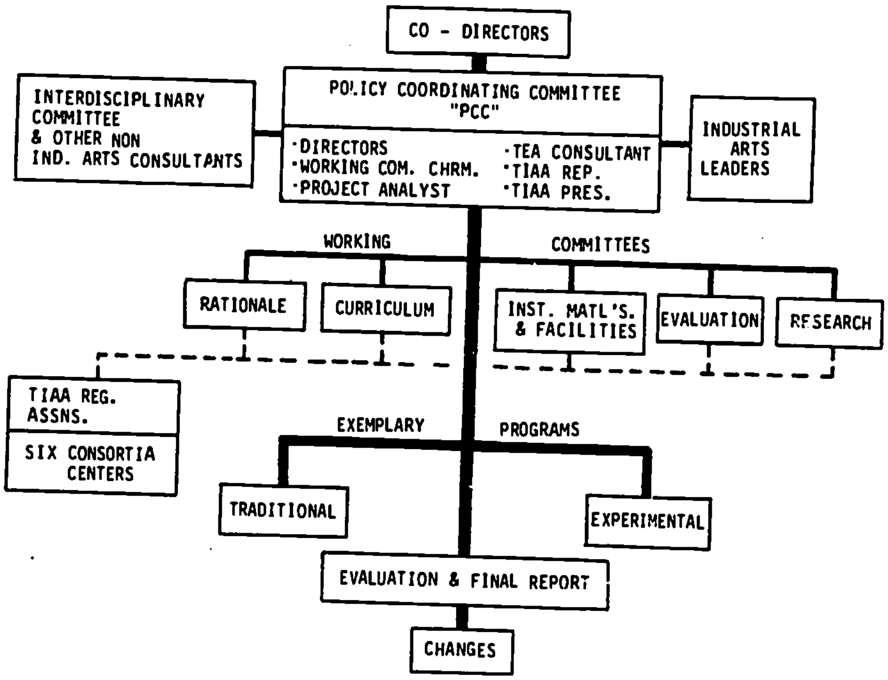
Input from classroom teachers is provided by a representative from each of the 19 regional industrial arts associations. These regional associations are geographically located to assure complete teacher representation from over the state. Also providing input, but of non-industrial arts flavor, are the coordinators from each of the six Texas consortia, or super regions, which also geographically portray the state.

The exemplary programs are the remaining facet of the study's organization. After the curriculum committee produces a conceptualized curriculum, appropriate personnel will design and develop courses, instructional materials, and facilities specifically for the exemplary programs in selected public schools. An evaluation will be made to determine the effectiveness of the new versus the traditional program.

CURRICULUM STRATEGY

With a plan conceived and an organizational structure developed to implement the plan, there still remained the problem of deciding upon a strategy to follow in deriving a curriculum.

The curriculum model decided upon and used to determine goals is quite similar to the Tyler Rationale.[1] Value judgments used in formulating goals for schools are greatly



influenced by the nature of the learner, society, and subject matter (technology). To establish which of these value judgments are worthy of adoption by schools, they are filtered through one's educational philosophy. Those values surviving the filtering process are deemed worthy educational objectives.

> With educational objectives established, content is then derived from a discipline to facilitate their attainment. This content provides the source from which experiences are selected to develop desired knowledge, skills, and attitudes in the learner. The efficiency of content to alter the behavior of the learner is evaluated by learning theories—or what we know about how people learn. These learning experiences, which have been screened through learning theories, constitute "The Plan" to change learning behavior. This becomes our curriculum.[2]

After the curriculum has been identified, an instructional system based upon contemporary educational technology will be employed to alter the behavior of the learner to accomplish the curriculum plan. This entails much thought and planning in organizing personnel, schools, facilities, classes, and subject matter.

IMPLEMENTING THE PLAN

To follow the curriculum strategy of considering the nature of society, the learner, and technology (subject matter) in developing value bases for this study obviously requires that these same three elements ultimately be analyzed.

The procedural design for carrying out the study is divided into six phases. The first phase is called "Orientation and Planning." To ascertain the degree of influence this study might have on teacher attitudes, a validated instrument will be used as a pre-test with every industrial arts teacher in the state before any study activities commence. The same instrument will be repeated later in phase two as a post-test at the conclusion of regional workshops.

Because 18 of the 59 people directly connected with the curriculum study are non-industrial arts people, the first phase is addressed principally to them. To accomplish the goals of this phase, all 59 members of the curriculum study will attend a one-day workshop. The goals of this workshop are to present a historical resume of industrial arts, to assess the status of industrial arts, to portray the relevance of studying technology, to delineate significant social changes taking place in society, and to explain the nature of the curriculum study.

Five members of the interdisciplinary committee attending this workshop will be asked to present position papers at a subsequent workshop in phase two. The five members to present papers are an educational philosopher, sociologist, business economist, industrialist, and a vocational educator.

The second phase is concerned with developing a rationale for industrial arts. The primary goal for this phase is a printed document showing justification for studying industrial arts in Texas schools upon which a curriculum can be developed that is consistent with the rationale and the recommendations of the Report of the Governor's Committee on Public School Education (August 1968).[3] This Governor's Report is the most comprehensive study ever made on education in Texas at a cost exceeding one million dollars.

This phase will be initiated with a two-day workshop designed to assist the rationale committee in their assigned task of developing a base upon which to build a new curriculum. To provide the rationale committee with an interdisciplinary input in order to gain current insights into the various facets of the learner, schools, society, and technology, experts previously mentioned outside our field will present their position papers wherein they discuss problems which, in their judgment, the rationale committee should evaluate as they develop the rationale.

After the proposed document is developed and printed, dissemination teams will visit each regional association over the state to conduct all-day workshops relative to the proposed rationale. These workshops not only make provision for teacher interaction, but they are also designed to solicit additional teacher input regarding the rationale.

Teacher input collected from the 19 workshops over the state will be fused into a revised edition of the rationale and then be returned to the field for another round of teacher interaction in the six consortia workshops. Phase two will be terminated when the final edition of the rationale is published.

Phase three is concerned with structuring the curriculum and deriving content and teaching procedures.

> In this portion of the study, the curriculum committee will have the responsibility for identifying the body of knowledge to which industrial arts should address itself. Then criteria for selecting content from this body of knowledge and for determining teaching procedures will be developed. Obviously, this committee will utilize many resources, including current curriculum projects such as the Industrial Arts Curriculum Project, American Industry, and the Maryland Plan.
>
> The remaining three phases, Four, Five, and Six, pertain, in order, to planning, to conducting, and to evaluating the exemplary programs. In this we will be demonstrating the new curriculum plan under controlled conditions to ascertain how well it accomplished its stated objectives.[4]

TENTATIVE CONCLUSIONS

An undertaking of this scope should accrue many benefits to all who participated in the study, to those for whom it was conceived—the learners—and to the educational community as a whole. Perhaps the conclusions enumerated in the study proposal succinctly describe some of the more worthwhile outcomes of this study: new standards for accrediting courses and certifying teachers of industrial arts; new course description and content outlines; revised curriculum monographs for each course; standards for facilities for use by administrators, teachers, and architects in remodeling or designing new facilities; public relations and guidance brochures for use by teachers, counselors, and administrators describing the contributions of industrial arts in the general education of youth; guidelines for teacher educators to follow in the revision of requirements for the preparation of industrial arts teachers; and guidelines for selecting and utilizing appropriate educational technology so that the new curriculum reflects American industry.[5]

Other conclusions are emerging, however, that seem quite significant to those working closely with this study. These conclusions are not listed in any sequence of importance and are enumerated only for one's perusal. No doubt as the study progresses we can add additional conclusions. A state industrial arts association can be a dynamic vehicle for providing opportunities for curriculum dialogue. A majority of industrial arts teachers in Texas want to improve their contribution to the education of youth. A significant number (statistically speaking) of industrial arts teachers' attitudes can be favorably altered if given an opportunity to be involved in an interaction format with their peers dealing with relevant curriculum issues. An interdisciplinary approach to curriculum upgrading strengthens one's philosophical posture in the educational arena and, furthermore, gains favorable support from the non-industrial arts community. Two major hinderances to more effective implementation of this study in a state of this geographic size have been the inability to establish desirable communication channels with the classroom teacher because of inadequate mailing addresses and the lack of foresight by not initiating dialogue in the early phases of the study with school administrators via their state association.

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Researching Curriculum Change

William E. Studyvin

How to effect change in the industrial arts curriculum—the first step is to recognize that a change and/or imp[illegible]ement needs to occur. This, of course, will be an assumption and may even become doubtful in the mind of the "recognizer" prior to any significant change.

In conjunction with the recognition that perhaps part of the industrial arts curriculum, regarding the concepts and knowledge being presented, needs improvement, it is inevitable that there is a certain amount of apprehension as to whether this will ever happen. Also in conjunction with content, the manner in which the curriculum is being presented may also need attention.

Industrial arts experiences should present concepts of industrial practices and procedures happening now and those that project into the future.

After a careful review of the present curriculum, a discrepancy or a void may exist relating to the information and activities that make up the program and what you think it should be. Now is the time for a realistic, objective evaluation. A study of all existing research projects should be explored. Along with the study of new emerging programs, study the present practices of industrial activities, as many as possible, and then some more. From this information, a realistic background of activities and information should be apparent.

The community can be an extremely valuable source of information, assistance, and support. You must get your community involved.

At this stage, the person involved, the "recognizer," will recognize that curriculum changes, new concepts, new and/or better ways of doing things will not just happen.

After review and analysis, recognition that change and improvements are, in fact, needed, the climate for this change must be set in motion. The climate will be defined as the total environment, including attitudes, necessary for change and adaptability. This can be done by informative reports to the board of education, the superintendent, and all administrative staff members. They must know what proposals are being planned in order to provide needed support.

The community must be involved at this stage also. This may be accomplished by communicating ideas through civic groups, etc. You will discover that some community group will be meeting each morning at 7:00 a.m., and you can be with them. Not only can you be with them, but they will be extremely happy to have you.

In addition to the support from the administration, the board of education, and the community, support must be gained from the staff and students.

One method of staff involvement in the area of research may be graduate courses. This was accomplished in a cooperative effort with a local college and staff. A course was designed, research projects studied, and the present curriculum was evaluated in regard to industrial concepts. Placing all this information in its proper perspective, plan the next graduate course. In this course, new concepts may be analyzed, and curriculum that will present the new concepts written.

Additional curriculum may be accomplished through summer workshops that involve teacher participation. They must be involved in curriculum. The teachers must be reimbursed financially for this work. This approach will be limited because of the financial problems involved.

In order to speed up the work at this point, another method can be used, such as a funded project. In this manner, additional teachers can be involved, and the changing concepts can proceed at a more rapid rate.

Through all the processes, the students should be involved in this matter of curriculum. This can be done either directly, indirectly, or both. If the curriculum has support from the school system, community, parents, and students, you will discover that from this point additional improvements will be less frustrating.

During the process, as feasible ideas present themselves, ACT. We can research, talk about, discover, compare, but without action, this really will not be extremely beneficial to the student and teacher, so plan action. Keep in mind that we are working for ideas to be placed into the actual learning situation. Get it there!

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Researching Curriculum Change/Curriculum Development in the Secondary Exploration of Technology Project

Harvey Dean

Research is nothing more than an open, welcoming attitude toward change. Research is looking for change rather than waiting for it to happen.[1] Each individual present has completed research activities in the past. But to develop and apply that research is another entity.

The term 'develop' connotes the movement from a point X (usually not a totally desirable point) to a more desirable point Y. Curriculum development involves change from a less desirable situation to a more desirable situation, program, activity, unit, lesson, etc. The parameters of curriculum development are generally noted in objective form, be they performance, behavioral or process objectives.

In the development of any curriculum, a basic structure or rationale for the body of knowledge to be dealt with must first be delineated. The delineation of a basic rationale is a developmental process in itself. And yet its import is second to none if effective curriculum development is to occur. Norman Cousins substantiates this logic in a simple statement—"Man's difficulty has never been in doing things; it has been in choosing what to do."[2] Such has been the case for conscientious industrial arts teachers. The choosing of 'what to do' to attain goals and objectives has remained a historical paradigm; i.e., since Woodward, the coffee table and the cedar chest have provided untold thousands of industrial arts teachers and teacher educators with a purported medium to convey the industrial world to their students--at any age level.

While this erroneous assumption has been cultivated—and even immortalized by teachers and teacher educators—the industrial society of America has continued to become greater and more complex. Fortunately, the dictum "teach as taught" is now being challenged. Industrial arts teachers and teacher educators are evaluating what has been and is being done in the laboratories of America. This is partially a result of the impact of such federally-funded research projects as the Industrial Arts Curriculum Project, The American Industry Project, The Maryland Plan, our own Secondary Exploration of Technology Project, and numerous others.

In all of these curriculum development efforts, there have been impediments to change. Arthur Schlesinger alludes to this in his comment, "The past is always dogging our heels, striving ceaselessly to bannish the present."[3] Enumerated below are several obstacles which should be recognized by those involved in curricular development.[4]

First, there is a lack of clear, shared understanding of educational objectives by those directly responsible for the complete developmental process. I submit that at no place in the college and public school curriculum is there a greater lack of clear, shared understanding of objectives, goals, and scope than in the industrial arts area.

A second barrier to change is the failure of those involved in curriculum development to evaluate proposed innovation in light of educational objectives. The goals of the Secondary Exploration of Technology Project from the outset have been to:

1. Identify concepts from industry and technology that may be used to develop secondary school curriculum.
2. Design and operate in-service training for teachers to enhance their ability to teach new concepts of industry and technology.
3. Develop learning experiences that will enable students to differentiate between occupational areas and contrast the social and technological difference between those areas.
4. Allow staff and teachers to write, review, and rewrite an instructional program in industrial arts that will be adopted by other school districts.[5]

The above goals are in addition to and subservient to the goals and objectives generally held by industrial arts since Wilbur.

A third impediment to change is the unevenness of acceptance of new ideas resulting from inadequate communication. Possibly the most prolific new industrial arts curriculum today is the IACP as developed by Ohio State and the University of Illinois. This project's acceptance by many school systems is indicative of adequate communication.

It would be presumptuous of me to believe that a majority of the industrial arts teachers and industrial arts educators have actually given a good deal of thought to their particular programs in light of industrial arts research findings. Possibly the greatest single contribution for relevant, educationally-defensible industrial arts programs will be the coming of educational accountability. For too long, accumulated equipment has been the criterion for evaluating an industrial arts program's worth—even greater the case for vocational education. The real state of the art may be exposed when teachers and teacher educators are required to prove the value of their niche in the total school curriculum. Equipment certainly cannot be construed as an indicator of program quality or accountability—that lot can only fall upon the teacher. A realization of these points should motivate teacher educators and classroom teachers to study trends of the time so that impediments may be circumvented and progress may be made. College industrial education programs must become cognizant of and tooled up for curriculum capable of training a total teaching core—a total industrial/career/occupational/education clientele. This core effort must come from institutions everywhere and matriculate throughout the total educational program.

The following overlay contains the total core elements (Figure 1). Note particularly the system element. For years industrial arts teachers have taught the components, while objectives have contended that we teach the system. Development is imperative in the systems area. Within any of these—the system, the units, or the components—the psychomotor, the cognitive, and the affective areas are omnipresent. To be a generalist, I think that industrial arts has touched upon all of these areas and has done a fairly decent job, but I believe that we have failed miserably in the teaching of "industry,"

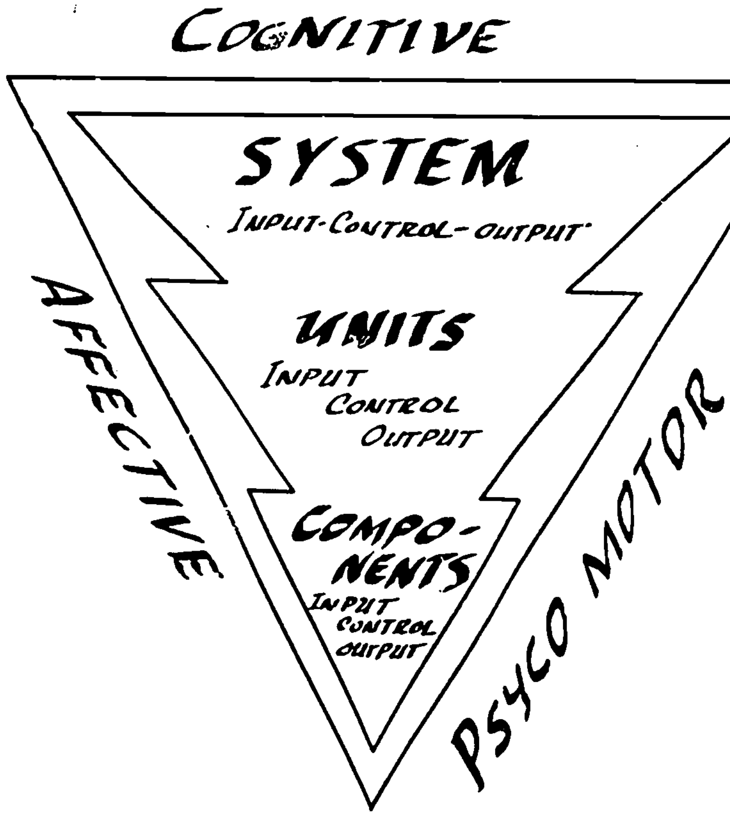


Figure 1

the system which we have contended since 1934 that we were teaching.

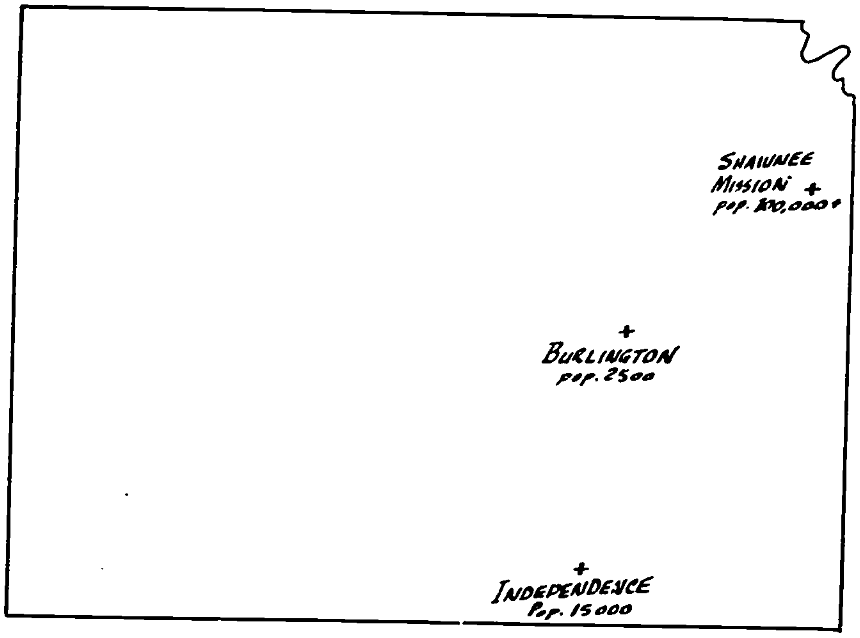
The foregoing paragraphs typify some of the reasoning behind curriculum development in industrial arts.

A summary of the previous paragraphs indicate that effecting curricular change involves internalized curriculum development, research of curricula to date, delineation of a rationale to serve as a base, awareness of impediments to change, and realization of the necessity for development in industrial arts, i.e., system approach rather than components approach.

The second segment of my speech deals with curriculum research involved in the Secondary Exploration of Technology Project.

The project was begun in May 1971 in Kansas. It includes three school districts (Figure 2): a very small district, a medium-sized district, and a large school district. Dr. F. Victor Sullivan is the director of the project. Much credit goes to Dr. Sullivan for the preliminary project research and groundwork. A hand-me-down curriculum developed in the ivory towers of the educational institutions was not the project director's vision.

The ten teachers involved in the S.E.T. Project attended a six-week pre-service workshop in the summer of 1971 held at Kansas State College. During the six weeks, the teachers were required to research and review all of the industrial arts funded projects which had been completed throughout the United States and Canada. The conceptual approach to teaching was presented, as well as many other psychological principles involved in the education of students. The teachers seemed to accept the psychological principles readily, possibly due to the fact that they had been in the classroom and the particular principles seemed more relevant now than when they first heard them in undergraduate school.



S.E.T. IN KANSAS

Figure II

One of the major tasks of the group early in the summer was the delineation of a rationale of industry. The participants studied approximately 30 innovative approaches. They concluded that they could build a program from the Structure and Rationale of Industry as delineated by the IACP. This is not to say that they disagreed with previous developments from that rational, but that the rationale was workable as a base for a total 7-12 industrial arts curriculum.

The summer 1971 session was devoted to the development of trial curriculum for the seventh and eighth grade programs in the various school districts. Defense of existing programs, lack of understanding of industrial arts objectives, desire for elaborate equipment, and communication were but a few of the impediments faced by the staff. Roadblocks to change were very vivid during the first two weeks of the summer workshop.

A core effort within the project did eventually evolve. The core involved ten teachers devoted to trial curriculum efforts. Curricula attempts were also proposed in several high school areas.

The attempts at the seventh and eighth grades have been varied. Material which the teachers are currently using includes the World of Construction curriculum and the World of Manufacturing curriculum, segments of American Industry, The Maryland Plan, and other of the contemporary approaches. However varied the particular activities may be, the basic approach among all the teachers is to teach the concepts of the industrial system. The coming in-service workshop for teachers during the months of June and July (1972) should provide curricula which hopefully can be disseminated (by October 1972) throughout the United States. Plans are to write alternative activities and design a systems approach to teaching a one-semester seventh grade course, a one-semester eighth grade course, or a one-year seventh grade course, or a one-year eighth grade course. We hope to provide an alternative to the IACP material based upon the same rationale and structure—alternatives which may be more appropriate to the small rural school.

At the ninth and tenth grade levels, very little has been done, and nothing has been done to which we can attach objective data. However, I would like to discuss with you briefly some attempts which will be made this coming summer in the areas of Materials and Process, Visual Communications, Power Transmission and Conversion, and Produc-

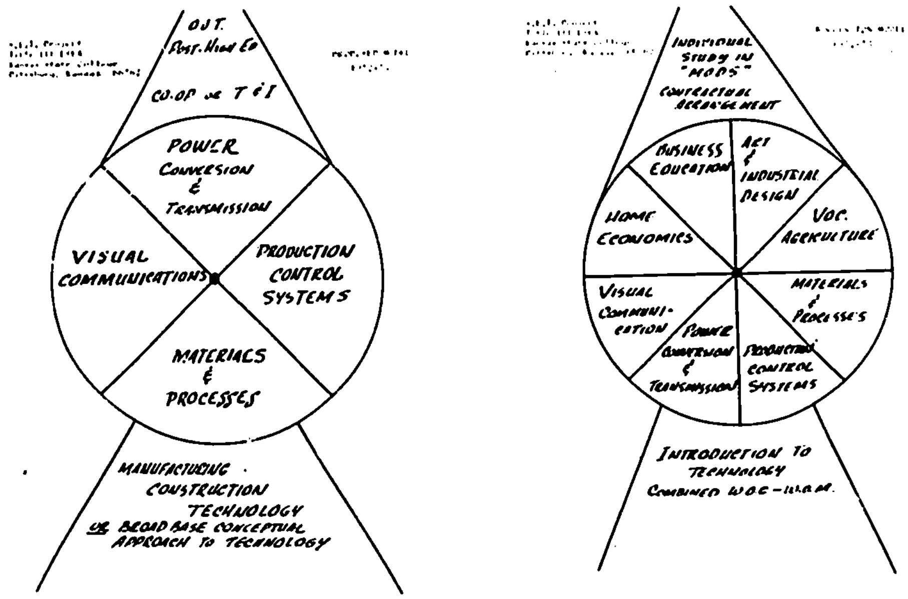


Figure III

tion Control Systems. Figure 3 represents our tentative proposed model for the senior high level students.

We hope to offer in each of the school districts a course called Visual Communications. Within this area we hope to incorporate photography, printing, technical writing, use of audio visual tape, layout and design, drafting, sketching, etc. Students in small team groups could develop a prototype product, proceeding through each of the areas delineated in Figure 4. This would then give the student the concept of how industry proceeds through the design and presentation of a prospectus of a particular product. We will attempt a similar systems approach in the areas of Power and Materials/Processes.

Figure IV

COMMUNICATIONS

A SYSTEM OF INDUSTRY—IN PROSPECTUS

ESTABLISH NEED
- DO MARKET SURVEY
  - SET LIMITATIONS
    - BRAINSTORM IDEAS
      - DESIGN - SKETCH - DRAW

PRODUCT PROTOTYPE — TEST PRODUCT
- PHOTOGRAPH
  - HALF-TONE PROCESS
    - PRINT

PREPARE TECHNICAL REPORT
- DEVELOP FLOW CHART
  - DEVELOP PERT CHART
    - WRITE JOB DESCRIPTIONS

PRESENT T.V. PRESENTATION

CLASS DECISION RE: MANUFACTURED PRODUCT

Possibly industrial arts' role in the career education plan as discussed by Commissioner Marland will be the conceptual approach to teaching in grades 7-10 with alternatives in the eleventh and twelfth grades for students not interested in vocational education or liberal arts education. Whatever its role, we feel that the S.E.T. Project will have an impact upon these areas.

In conclusion, I would like to leave with you a thought that has permeated the discussions of the S.E.T. participants. "If you give a student a set of instructions, he will have a product; if however, you give a student a picture of the total system, he will have an understanding from which he may build many products."

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Concerns of Teacher Education

Ross C. Hilton

Today we've had men walking and riding around on the moon. Technology has developed many new and helpful articles and processes for the betterment of our living, yet our students are doing and learning the same things as we did 20 or more years ago. What we see is a result of how we teach and what we teach. Are you satisfied with what you see? Are you as up-to-date and as innovative as you can be in your teaching? Are your programs changing as new materials and processes are developed? What is our responsibility in making the changes that are needed today to make education of the 70's relevant for all youth? We must start in our own classrooms to put these changes into practice. We must provide an effective program to study the industrial technology which is essential not only for today but for the foreseeable future.

The total industrial arts program, from K-12, must help prepare all youth to meet tomorrow's work demands. Do you know that approximately one-half of the children born today will be going into industries that do not currently exist?

We need more foresight and not so much hindsight. We must be model teachers. Dr. Ernest Minelli told us in Portland last December that the new breed of teachers must be:

Mature, intelligent, insightful, and ingenious—a universal man possessing a professional, liberal, and specialized education.

Student-oriented—must know the student's needs and be able to bring about changes in his behavior.

An instructional specialist, familiar with the latest instructional media, able to perform with a high degree of efficiency, employing instructional techniques with great precision.

A versatile person able to function effectively under a variety of circumstances and in a constantly-changing instructional setting.

Skilled in the identification and development of specifically measurable objectives that reflect student needs in the cognitive, effective, and psychomotor domains.

Skilled in designing appropriate learning experiences and evaluating student progress and teaching effectiveness.

Capable of working cooperatively with others as a team planner and teacher.

A super realist with up-to-date knowledge of the world of work.

How do you measure up to such qualifications? Is anyone teaching this way? Yes, a few, but what about the majority? Let's look in on some typical situations and see.

I visited one industrial arts lab and foundboys doing the same and similar wood joint exercises that their fathers had done 30 to 40 years previous. I asked the instructor what projects of industrial-type experiences the students were exposed to, and he answered, "Well, we just don't have the time for anything after they get the exercises done."

I visited another class that was working in advanced drafting; all I saw was copy work from old textbooks.

One school I visited taught Jr. High Woods and Sr. High Woods; I've heard such programs called bedroom 1, 2, and 3. I asked the instructor what else he taught, and his answer was, "Well, they draw a little of their own plans if they can't find some already made or can't borrow some." I asked about the other areas of metals, graphics, electricity-electronics, power, plastics, etc.; his reply was, "We've always had a good wood program, so why fight a good thing?"

What was the type of instruction that these three instructors received? How were they teaching? Was it a class in industrial arts or just a hobby class? How prepared were their students to meet the world of work? Are you teaching as you were taught?

I visited a junior high laboratory in beginning woods and found core projects of the broomholder and bread board that were old 20 years ago, using the old drawings and patterns and the models the instructor had for display. I'm sure he had been using the same unit for many years. He wasn't teaching; he was just a ditto—he was in the old rut (a grave without ends). I can imagine a seventh grader coming into his class and saying, "Do we have to make a broomholder this year? Mom has four of them that my older brothers made."

In another school I visited a general shop class that had a unit in manufacturing and found a well-organized group of students working on a well-planned mass production unit building creepers for sale to automotive mechanics, students, teachers, etc. The class was busy, everyone doing his assigned job in the total organization; there was enthusiasm and interest expressed by the actions of the students. I asked one student what he was doing; his answer was, "I'm a quality control inspector, I check to see if these parts are the correct size so that they will all fit when we start the assembly line." What will you do then, I asked. "Oh! I'll be putting the casters in place on one corner as they come to me from the one in front of me." There I witnessed students not only doing one job, but two or more in order to role-play and work through the various positions in the mass-assembly production unit.

Another school I visited was busily engaged in making archery equipment, bows, arrows, strings, quivers, etc. All I could see was bow-making equipment all over the lab. The instructor informed me that the boys had made 38 bows so far that year and that some of the students who couldn't or didn't take shop were coming in after school to make one for themselves. Maybe I judged too quickly, but I couldn't see any evidence of anything but bow-making being taught in that small high school lab. I ask you, is this all there is to the industrial arts program?

I've also visited many unit shops in which there were both good programs and poor programs. From my visits, I concluded that the instructor is the key to whether a program is good or poor. He, in the main, selects and outlines the total industrial arts curriculum, and it is his proficiency and enthusiasm that carries the program to his students.

Now, why did these teachers teach in the manner that I observed? Were they teaching as they were taught?

How can we expect the students of today to work in the technology of tomorrow unless we teach it to them? We, as teachers, must reach each individual student, find his wants and needs, and try to direct him so that he can realize them. We must up-date and change our typical programs to include the industrial techniques, methods, and materials of today.

What new things should we include? Some I could list are as follows:

Should we include the processes, materials, and products made from the new and changing industries? Do we as consumers handle or use anything made of plastics each day? We do; very many products contain some plastic. We really must include a unit, at least, on industrial plastics concerning new uses in industry, medicine, home, food preparation, etc.

What can we include from the spectrum of power? Besides the usual small gas engines, do students understand fuel cells? Do they know of practical applications of their use, their high efficiency, their reliability, size, etc.? The space program can give you much information relating to fuel cells.

How about bio-cells? We can furnish power enough for whole cities from a bio-cell farm in our oceans. Yes, it is possible. What type of bacteria can live off of one another and produce electrical power that might be used for propulsion along our highways? What other uses are there for these cells?

How much do our students know about solar energy and its power? Could we even harness some of it for travel power? Can we store its energy for future use?

Can atomic power be used to replace the engines of today? What implications can we teach regarding atomic power that apply today and will also apply tomorrow?

In the new and ever-growing field of electronics, we must include some instruction on solid-state components and on integrated circuits. With industry and the military using circuitry so rugged and so small, we must surely need instruction on their repair and maintenance at least, let alone the instruction that is needed for design and operation.

We could also give instruction on the processes of having future 3-D color TV by the use of holography. Imagine being able to see a 3-D color TV program projected on your wall so real that as you walk from one side of the room to the other you actually see a different side of the objects or persons on the screen. Impossible! No, it is today a research laboratory reality. Industry is using holography as a means of photographically watching and monitoring parts manufacture. It also has a peculiar property of photographically recording great quantities of information on a single sheet of film. Kits are actually available for experimentation in holography.

Shouldn't some instruction be given regarding the propagation and use of laser light in such fields as communication, medicine, the cutting of metals and of other substances, their use in guidance systems, etc.?

What should be included from the computer field? There are so many uses of computers, their operation, the languages, etc., that the basic understanding should be taught to all students.

New drafting processes, procedures, skills, new techniques, and applications all have a place in the curriculum if they are not now included.

A study of ceramics with its uses and properties such as a new dimension in cutting tools, bonding to metals, heat shields, etc., as well as everyday consumer use are all important for the student. Are we able to teach any of these?

The area of adhesives is so new that very little is ever considered important enough to be included as instructional material. We give some instruction about a few adhesives used in woodwork and let that suffice. There are adhesive agents available today to make bonds between metals, synthetics, wood, textiles, ceramics, etc., that are cheaper, stronger, more elastic, quicker, and easier to apply than any other known method of bonding these materials. Why not include this information as important to be taught? Some of you traveled here in planes held together by adhesives.

New automotive power plants that have sealed units, having no lubrication or cooling problems, are being tested today. New electronic guidance and control systems to aid traffic control, development of practical steam engines, electric propulsion, etc., are challenges that technology is working diligently to perfect for consumer use. Should this be taught to our junior high and high school students?

Information about new paints and finishes, new methods of application, pre-finishing, fire-proof and fire-resistant finishes, treatment of metals to prevent corrosion, etc., is available for instruction. Is this important enough for curriculum inclusion?

There are other areas we could possibly explore such as food packaging, reprocessing, preparation, etc., that may be possible in the next 20-50 years. We might be eating soybean meal or plankton processed for consumption. Right here in Texas is a plant to develop proteins from hydrocarbon and nitrogen. There is also a plant in France that is using petroleum protein. Imagine driving up to a service station and saying, "10 gallons of gas and 2 large petroburgers, to go, please."

How much do you teach about solar energy and solar heat, solar ovens, solar engines? This is a totally untapped source of energy. A man in Denver is working on heating his home with solar energy. Does it have implications for instruction in industrial arts?

Bell Laboratories recently came out with a little cubic inch of crystal that contained over a million complete radio circuits. Fantastic? Yes; are you up-to-date on things like this? Should we teach something about a new memory core for computers that uses magnetic wire instead of the older magnetic rings? Could we also include some new structural approaches in using various materials? Examples could be corregated cardboard laminated into walls and partitions for building construction, crushable honeycomb used in automobile bumpers, etc., plasticized coverings of many materials, reinforced fiberglass products, reinforced and pre-stressed concrete for buildings, bridges, —

The list could go on and on. Even as we sit here today, new industrial processes, new materials, new uses of products, new employment needs, new training requirements are in the process of becoming realities. Do we have any obligation to keep abreast of these things? YES, we do. As professional educators, we must advance to survive or coast and be replaced.

How are you as a teacher measured for success? Is it by the number of students you can attract to your classes? Is it by the type of employment you enjoy? Is it by the size of your home, your car, or your worldly possessions? Or could it possibly be that your success is a direct result of the products you produce—students equipped to meet the world of tomorrow? Are these products, your students, progressive and successful themselves, are they good citizens helping to build a better community in which to live?

You know, if we take three eggs, a hen's egg, a turtle egg, and an alligator egg, and put them in a dark room, it is quite hard to tell the difference between them; we can't see the differences. But, if we provide a method of hatching each one, we can quickly see that the end product is quite different. We could put three people in a dark room and likewise find it hard to tell differences, but if we have each one do a particular job or perform a skill, their performances show us the differences that they have. Could we say that beginning teachers might be somewhat alike (in the dark room before they start to teach) and that as they teach they manifest the differences in their abilities and interests? Are their end results the same?

What are your end results like? How do you measure up to the challenges and responsibilities of an industrial arts teacher? Are you proud of your products? Are you a success?

Here are nine personality requirements listed by educators as a measuring stick for a successful teacher.

A successful teacher must be committed
- to democracy as our basic form of government.
- to education as a major force in shaping and reconstructing our society.
- to vocational education as an important phase of the educational process.
- to teaching as a first choice of jobs.
- to his trade—the subject of his primary interest.
- to his school or institution.
- to his immediate supervisor and/or colleagues.
- to his students.

A successful teacher must be professional
- by joining professional organizations and actively participating.
- by developing or by continuing to develop professional and technical competence.
- by assuming new forms of professional and social behavior.
- by living by a set of professional ethics— a code of standards.

A successful teacher must be compassionate
- by comprehending the dignity and worth of the individual.
- by understanding that people differ significantly.
- by his interest in guiding and directing learning experiences.
- by being sensitive to his responsibilities as a professional educator.
- by being patient.

A successful teacher must be systematic
- as demonstrated by an ability to organize himself to accomplish a given task.
- as demonstrated by his ability to organize learning experiences in a logical and systematic fashion leading to effective and efficient learning.
- as demonstrated by his ability to maintain his classroom and/or laboratory in a business-like manner.

A successful teacher must be gregarious
as he likes people—especially the age group he plans to teach.
as he is outgoing.
as he is easy to get to know.
as he is a salesman.
as he demonstrates self-confidence.

A successful teacher must be articulate
in order to use the language properly.
in order to be understood.
in order to select appropriate examples and illustrations.
in order to communicate complex ideas readily.

A successful teacher must be flexible
for he is conscious of a changing environment.
for he is sensitive to the impact of technology upon education.
for he is adaptable to changes in content within his subject.
for he is receptive to changes in methodology.
for he is willing to accept another's point of view.

In matters controversial
My attitude is fine;
I always see two points of view
The one that's wrong and mine.

A successful teacher must be zealous
for enthusiasm is contagious in the learning process.
for he is devoted to his task.
for he is eager to serve as a member of an educational team.
for he has a desire to make a contribution to his community and to his fellowman.

A successful teacher must be religious
as evidenced by his church membership.
as evidenced by his stability.
as evidenced by the security of his personal convictions.
as evidenced by his own actions.
as evidenced by his faith in God.

SUMMARY

We have discussed nine selected personality traits that may be valid indicators of the successful trade teacher. We have described quite a person. Recognizing that no mortal man is perfect, one should not expect to find prospective faculty that possess all of the qualifications described. As an administrator, one hopes to find teachers who possess many such qualifications and who have the potential to develop other qualities. We must remember that personality traits are independent of each other, and as such, there is little way for an exceptionally strong trait to make up for a void or a weakness.

To exemplify the theme assigned me today, I have brought three potato friends with me. Each one could represent a particular teacher or situation that we might be familiar with. As I explain each friend, you see if he exemplifies you and your teaching or someone you know.

No. 1 is called the Anticipatator. He is the teacher who anticipates that only a few of his students will be interested at all in what he teaches, so he thinks, "Why knock myself out trying to get all these dumb kids to learn; they won't really use any of this stuff anyway." He thinks most students are there because of state laws, parental pressure, and to visit with each other and keep warm. New ideas and courses are too hard for him to teach anyway; he is too busy to take any evening or summer classes, and besides, that costs money. No. 1 is content to growl at the students who don't like what he teaches and at those who disagree with him. He waits for one payday after another and hates the kids, the work, and the school. He isn't happy, nor is he very productive as a teacher. Do you ever have any of his feelings or traits? Do you know someone who has?

My No. 2 friend is named the Spectapatator. This teacher is all eyes for anything and everything to teach. He is so busy with his ideas that he hasn't time to organize and really teach; he just flits from one idea to another, leaving confusion and uncertainty behind him.

He means well, but just can't concentrate on one subject long enough to cover it adequately for student understanding. He tries to teach all things to all students. Is he exemplifying your "theory," your "thing"?

Next I will introduce my friend No. 3, Participatator. He is the ideal teacher by the student's standards. He is always friendly and willing to help them, yet he commands their respect because of the skill in and knowledge of his subject matter areas. He is up-to-date in all he teaches and constantly challenges his students with new information. He is professionally active in his local, state, and national associations and is constantly eager and willing to spend some of his summers and/or evenings in special classes to keep abreast of current industrial trends. He also reads the professional journals and books he obtains. In snort, this friend of mine is the teacher I'd hope to be.

Well, how do you personally rate up to these three tato friends? Are you most like No. 1, No. 2, or No. 3? May I challenge each and every one of you to strive to be more like No. 3.

In conclusion, I would exhort each of you to look carefully at your teaching methods and curriculum. Are they as modern and up-to-date as you can make them? Will they produce an end product that will be what you and others see as the teacher or student of tomorrow?

What you get is what you produce.

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Middle School Industrial Arts Curriculum Study

Raymond Bernabei

INTRODUCTION

Every youngster has the right and responsibility to develop his own self-concept of life. This can be accomplished by providing the individual with opportunities to develop his intellectual curiosity, creativity, critical thinking, aesthetic judgment, structured study habits, and the beneficial use of his leisure time.

A youngster needs many opportunities to learn why and how society has been affected by continuous development of materials, tools, machines, and productivity through the entire industrial complex. He needs to know of the complex technological-oriented society in which he lives, works, and plays.

The Bucks County Public Schools' Industrial Arts Curriculum Committee reviewed programs in our schools to ascertain what constitutes the basis for these programs. The committee was looking for the special needs of young boys and girls at the junior high level. With the emerging middle school reaching full bloom, there exists a need for direction to develop a program designed to the special characteristics of pre-adolescents.

The committee has researched the chief characteristics of pre-adolescents, reviewed the modern theories of learning and related literature, and attempted to set these findings into a fundamental philosophy for learning at the middle school level.

Beginning with Pennsylvania's Goals of Quality Education adopted in 1965, the committee accepted the challenge to review and interpret these goals as they relate to the middle school industrial arts curriculum. These relationships were then written as narrative descriptions of behaviors inherent in industrial arts.

The purpose of the committee was to design a far-reaching program for the middle school which will permit many of the student's learning activities to evolve from the industrial arts center.

A review of the model structure will give the reader an insight into the committee's desire to create experiences in terms of goals and domains relevant to life adjustment career behaviors.

PHILOSOPHY

The middle school can be a dynamic learning environment, providing the philosophy unique to the individual pupil is meaningful and realistic. Since the success of a program is dependent upon the beliefs of individuals, the philosophical premises upon which this study is based are as follows: Emphasis must be on learner characteristics. Personalized learning experiences should comprise the major part of the curriculum. The emerging adolescent learns best from the concrete to the abstract. Curriculum must be varied and flexible. Learning experiences should be patterned for learner success. Middle school environment is best suited for the learner to attain the major developmental tasks of emerging adolescence. Consideration must be given to career awareness activities.

RELATED RESEARCH AND LITERATURE

Historical Background

The middle school emerged in the early and mid-1960's because of a dissatisfaction with the accepted patterns, practices, and curriculum of the junior high school. The junior high school curriculum, represented by elected subjects, special class projects, and extra-curricular activities, tends to pressure the pre- and early adolescent to excel physically and socially. This pressure may present emotional danger for youngsters because of the spread in maturation levels. The junior high school foisted an organization on the "in-between-ager" of senior-high-mimicked extra-curricular offerings and the demands of subject matter-oriented high school programs.

The middle school will provide greater stimuli to the developing interests of children through encouraging independent learning, educational guidance, and differentiated instruction. The middle school must offer a program planned for a range of older children to early adolescents that builds upon the elementary school program for earlier childhood and in turn is built upon by the high school's program for adolescence.

During the time the students are in the middle school (grades 5-8 or 6-8), they are going through a very difficult period of adjustment. The onset of puberty creates tensions and changes in attitudes which make it very important to the learner to be accepted and respected by his peer group, to be understood by his teachers as well as his parents, and to have a feeling of self-accomplishment and worth.

Emerging Needs

The middle school curriculum must focus on the learner and his individual attitudes, needs, and learning characteristics. The middle school must be child-centered. Flexible scheduling with a team approach allowing teachers to work as specialists in their areas of strength is a departure from the self-contained elementary classroom. The curriculum also must be varied and flexible. Emphasis should be on child development related to perceptual-motor activities, cognitive and affective skills, and understandings conducive to goal-oriented behavior rather than a set rigid amount of curriculum content.

Learner Characteristics

The trend of thought today is that children are maturing earlier, therefore, sixth graders fit into a program with seventh and eighth graders. The students' needs are special at this age, and they require special knowledge and understanding. The middle school student is experiencing puberty and a sudden orientation toward adult values. Students reaching puberty do not want to be considered "little children." Human growth is continuous, and the middle school offers many advantages for a smoother transition into adolescence. The children do not change uniformly but according to each youngster's own timetable.

The emerging adolescent-learner has an increasing awareness of the world, himself, and his own identity within the social structure. He is concerned about his own personal development and his relations to peer groups. The age grouping of youngsters in the middle school makes for a more homogeneous group in terms of their needs and development. Without the influence of older or younger children, the middle school can better meet the needs of the students through a child-centered program.

The middle school program should allow for human variance in the development of communication skills, cognitive processes, concept formulation, creativity, attitudes, and individuality. The child's mind should be regarded as an instrument for learning rather than a warehouse for knowledge.

Summary

The middle school can be a dynamic program of education for transescents providing educators have a valid philosophy, unique course of action, resourceful staff, and an appropriate plant in which all of these ingredients can be properly mixed. The key to the success of the middle school lies in the philosophy which guides the implementation of a program that understands the complexities of this age group.

STATED ASSUMPTIONS

When devising a school curriculum, one begins with a basic belief—a philosophy. This philosophy is often derived from values predicated upon assumptions. In considering a middle school curriculum, which has as its base, a discipline including concrete experiences related to the needs of the middle school pupil, three categories of assumptions evolve. The following assumptions are statements of principles unique to the development of a model curricular program to be tested empirically.

General Assumptions:

1. All children are different: learning at varying rates, using different styles, and applying varying modes.
2. Task-related opportunities, preferences and choices leading to successful achievement give rise to positive personal values and aspirations of the individual.
3. Successful school experiences provide the individual with self-reliance which enables him to solve new problems and adjust to new situations throughout life.

Career Assumptions:

1. Clusters of career skills are derived from (certain) psychological constructs.
2. There are behaviors common to all curricular subject areas providing for related change of career choice.
3. Related exposure of the concrete to the abstract in learning experiences permits more flexibility in career decisions, thus avoiding the typical curricular track system.
4. Data generated from a model structure would provide empirical evidence of skills and behaviors relevant for success in a variety of careers.
5. Data generated from a model structure could be used in describing more precisely relevant life-adjustment behaviors.
6. A model could provide the framework for identifying and integrating common behaviors of learning within the school curriculum.

Curriculum Assumptions:

1. A curriculum is derived from stated goals.
2. A curriculum may be defined in terms of its psychological parts (Process Domains), its inherent behaviors (Content Objectives), and the goals of education (Product Aims).
3. The functions of experiences within a curriculum (from concrete to abstract) are related to the degree of transfer of learning.
4. A functional model provides for relating behavioral objectives to process-product-oriented constructs.
5. A model provides a basis for describing life-adjustment behaviors related to careers.

PROCEDURES

Progress in 1970-71

Late October 1970, a concerned group of industrial arts teachers attended a meeting with the Bucks County Assistant Superintendent of Schools and representatives from the Industrial Arts Division of the Department of Education. The major purpose for the meeting was to determine if a need existed for a fresh look at the role of industrial arts in the middle school.

As a result of this initial meeting, it was decided to conduct additional sessions for researching the problem. Upon review of the related research and literature, the committee concluded that there was a need for constructing a theoretical curriculum model for middle school pupils. Several assumptions were made at this time as a result of group interaction.

First, the middle school program should consist of educational activities which are concrete, tangible, and real for the emerging adolescent. Therefore, the industrial arts program can serve as the core for the total middle school curriculum.

Second, the learning experiences to be implemented in the middle school industrial arts program should consist of the higher-level cognitive processes. Therefore, industrial arts middle school programs can be recognized as a functional discipline within the levels of analysis, synthesis, and evaluation.

The same must be stated for the affective and perceptual motor learning domains. Industrial arts operates in the highest levels within the three domains when the program is evaluated in light of the learner and the learning process.

To facilitate an objective approach to our goal of developing a Model Middle School Industrial Arts Curriculum based on the educational needs of the emerging adolescent, the committee decided to work under no constraints or limitations (i.e., building, facility, financing, staff, present and past curricular programs).

Our initial task was to collect relevant information about the learner. His interests, needs, developmental tasks, and abilities were a few of the areas researched.

Descriptive statements (Glatthorn, 1970) relating to what we know about the needs, interests, and characteristics of the middle school learner are:

1. There are significant individual differences in every major aspect of growth and development.

2. The middle school years are marked by rapid physiological change, fatigue, hypermobility.

3. There is strong but often covert interest in the significant sex changes taking place.

4. There is much emotional stress that shows itself in aggressiveness or moodiness. Much of the worrying focuses on school.

5. There are strong signs of developing interests in college and specific career choices.

6. There are ambivalent feelings about the opposite sex, with best work often done in sex-segregated groups.

7. There are strong interests in sports, competition, all physical activities, individual hobbies.

8. There is a developing sense of conscience, a concern with fairness, an attempt to adhere to moral principles, although there is a special sensitivity to deviant influences.

9. There are very strong socialization needs, with high responsiveness to peer values and peer pressures.

10. The middle school learner seems to prefer a teacher who sets reasonable limits, can enforce them with a sense of fairness, and has a sense of humor.

11. There is a developing sense of independence and a nascent desire to be free of adult authority, although there is still a need for adult direction. There is a strong need to develop the skills of self-directed learning.

12. There is a short attention span in his learning, although some interest in long-range projects begins to develop in a few.

13. There is a strong interest in such school elective areas as art, music, home economics, industrial arts.

14. There are some signs that the middle school years may be marked by a declining rate of intellectual growth.

15. In the early years of the middle school period, the learner moves into the stage of formal operations, as identified by Piaget.

16. The middle school learner prefers physical activity in his learning; he wants to build, explore, experiment, play, test.

17. The middle school learner is very ready to imitate the older adolescent and learns readily from him.

18. The middle school learner has an exaggerated sense of idealism and tends to dichotomize.

19. The middle school learner dislikes passive listening and viewing as a member of a large audience.

20. The personal interaction and relationships with the teacher are highly important to the middle school learner.

21. The middle school learner needs an opportunity to think flexibly in a "conversational dialectic"—in a non-judgmental atmosphere.

22. The middle school learner needs an opportunity to try out various roles and identities.

23. The middle school learner needs to discover significant ideas and modes of thought that transcend curriculum boundaries.

24. The middle school learner needs much opportunity to explore, without too much threat of failing, new ways of learning; new interests; new drives.

25. "The young adolescent needs a psycho-social respite, a moratorium from social pressure, in which he can explore new behavior patterns without fear of social embarrassment." (Erikson 1964)

Goals of Quality Education

After the learner characteristics were adopted, the committee focused on the educational goals of the middle school. Pennsylvania's Ten Goals of Quality Education emerged as our base. It then became apparent that the "What, Why, and How" questions related to the goals were to be answered and understood by the committee.

The Quality Education Program Study (QEPS, 1970) was proposed in response to Act 299 passed by the General Assembly of Pennsylvania in 1963. This Act calls for the development of procedures which will provide school personnel with relevant data with which they can strengthen their educational programs. The Educational Testing Service of Princeton, New Jersey, recommended the Ten Goals of Quality Education for the Commonwealth.

The Pennsylvania State Board of Education adopted the following Ten Goals in 1965:

I. Self-Understanding
II. Understanding Others
III. Basic Skills
IV. Interest in School and Learning
V. Good Citizenship
VI. Good Health Habits
VII. Creativity
VIII. Vocational Development
IX. Understanding Human Accomplishment
X. Preparation for a Changing World

In an effort to further increase the utility of the Goals to the practitioner and the evaluator, the Quality Education Program Study was designed to review, define, and clarify the Ten Goals. The Critical Incident Technique, developed by John C. Flanagan, was used as a major research tool to collect empirical data to define the goals.

The resulting descriptions or definitions for each of the Ten Goals include: (1) Student behaviors, (2) Rationale, and (3) Teacher Strategies. Also, for each Goal, QEPS has developed needs assessment instruments to provide a mechanism to systematically gather information to assess its needs and assign priorities to those needs.

Throughout the three phases of the project, participants and other members of the educational community were informed of QEPS activities by county newsletters, press releases, and personal contacts. In addition, a slide-tape presentation describing the history, structure, and progress of QEPS was made available to interested groups.

Using the statements provided by the Pennsylvania Department of Education explaining each Goal of Quality Education, the committee decided to write narratives explaining implications of each goal related to the middle school industrial arts curriculum. As a result of this analysis, the following narratives were approved and adopted by the committee.

GOAL #1: SELF-UNDERSTANDING

Industrial arts provides concrete tangible experiences which enable each student, independently and as a group member, to explore, discover, and develop his interests, values, intellect, and motor skills. The student, in attaining his degree of success through these experiences, develops a realistic understanding and attitude of his own self-actualization process. This will enable him to choose a way of life rewarding to himself and society.

GOAL #2: UNDERSTANDING OTHERS

Industrial arts activities will expose the student to different social, cultural, and ethnic groups. Through interaction, students help each other to attain a mutually acceptable goal. This action-oriented setting will enable him to adjust, accept, and understand his peers and develop a better appreciation of others' problems.

GOAL #3: BASIC SKILLS

Industrial arts (content and experiences) enable each student to acquire and use the basic skills to read, listen, communicate verbally and visually, to manipulate math concepts, and make logical decisions.

GOAL #4: INTEREST IN SCHOOL AND LEARNING

Industrial arts provides each student with opportunities to utilize his interests and abilities while solving problems. These opportunities will help each student to acquire positive attitudes towards school and the learning process.

GOAL #5: GOOD CITIZENSHIP

Activities in the industrial arts afford students the opportunity to become effective leaders or responsible followers. A student working within a group, a team, or as an individual will perceive his rights and responsibilities by developing positive attitudes towards human, technological, and natural resources within his society.

GOAL #6: GOOD HEALTH HABITS

The student is made aware of and is afforded the opportunity to experience realistic safety procedures. The student becomes aware of the potential hazards that exist in the environment and the possible results of negative behavior.

GOAL #7: CREATIVITY

Industrial arts experiences encourage and provide opportunities for creativity. Given freedom of expression, the student can experiment, explore, and carry out ideas with a variety of tools, materials, and processes.

GOAL #8: VOCATIONAL DEVELOPMENT

Industrial arts affords the opportunity(ies) for each student to develop his self-interests and to experience individual success. Understanding the opportunity(ies) available to him in preparing for a productive life, the student can make independent decisions related to his future education and career.

GOAL #9: UNDERSTANDING HUMAN ACCOMPLISHMENT

The student in industrial arts will be made aware of man's interrelationship with the changing world of science and technology through new materials and processes. He will become familiar with the principles of good design, production techniques, and develop a sense of values to critique and appreciate the products of nature and society.

GOAL #10: PREPARATION FOR A CHANGING WORLD

Society continues to change with resultant technical, environmental, social, and cultural problems. Industrial arts will develop a student to be a thinking, problem-solving individual capable of adapting to or coping with a changing society.

A portion of a two-day in-service workshop was reserved for the purpose of analyzing the work to date and disseminating the results. The intention to use the workshop was not only to disseminate information, but also to provide the workshop participants an opportunity to critique the narratives developed by the Bucks County Public Schools' Middle School Industrial Arts Curriculum Committee.

The final phase of the first year's activity of the Committee was to develop a curriculum model matrix which established the Ten Goals of Quality Education as its base.

Model Structure

Education lacks a true relationship between goals, objectives, and domains of learning. A test of this is when asked to relate subject-area content in this way, one is hard-pressed to achieve this end. Because of this, a group of interested industrial arts educators have been meeting to cope with this problem.

This technique should provide means whereby the goals, domains of learning, and content would have a level of precision to judge more adequately the curriculum best suited for middle school children.

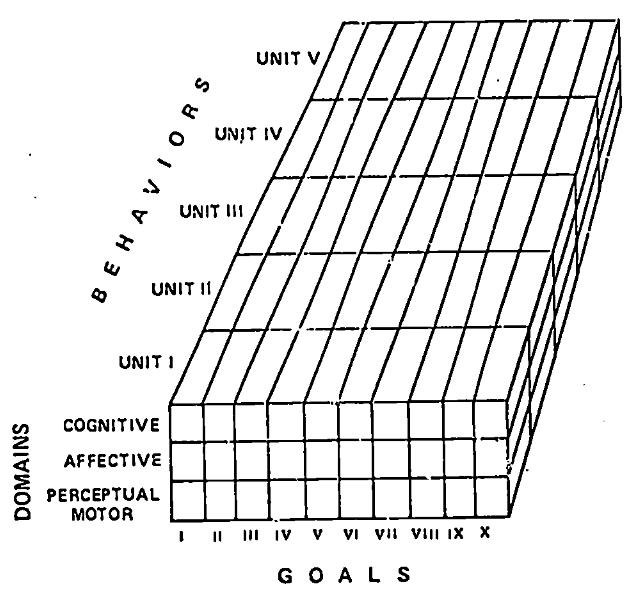
Traditionally, industrial arts has been considered as a "dumping ground" for students not able to cope with academic subjects. It has also been said that the industrial arts is not a discipline-oriented field; that skills in doing something far over-shadow the intellectual and feeling processes pupils achieve in their schooling. One will even find the industrial arts located in the basement or "attached" to an end of the building. Much of what went on in the past was probably done in good faith towards meeting the needs of pupils.

While it might be fair to say that the industrial arts formerly related to remedial programs for retraining individuals in adjusting to life-skills, the major trend today is to conceptualize educational programs in industrial arts by emphasizing changes related to goal-oriented behaviors. It is our belief that as a student in an industrial arts program develops a degree of skill, he progresses in the intellectual and feeling processes as well. There is an abundance of research evidence indicating that the pre- and early adolescent needs concrete experiences before presenting him with abstractions. Under this premise, it is necessary to be familiar with the details of the several taxonomies and goals of quality education. These dimensions could be used as guides in identifying relevant psychological constructs in the Industrial arts for a middle school curriculum.

The taxonomies and goals also provide the curriculum worker with a conceptual framework for categorizing significant behaviors of learning, as well as a guide within which test items might be constructed. Once a program begins to be implemented, then its assessment of intended behaviors is essential. It should be recognized that behavioral changes not intended sometimes occur. Evidence of this nature should be used in devising more precise learning activities and test items related to those behaviors. In this way, a program may be evaluated m readily in terms of the designated behaviors expected of middle school children.

In developing a curriculum for the middle school, the Bucks County Public Schools' Industrial Arts Curriculum Committee decided to look into the problem of co-existing curricular behaviors or patterns. That is, are there common behaviors in science, math, and industrial arts? Are there psychological constructs in science, math, and industrial arts common to the goals of quality education? This prompted the committee to investigate the proper procedure in initiating some action. After much thought, the discussions led the committee to believe that the necessary first step was to design a model. After reviewing and evaluating the more prominent curricular models available, it was decided that none completely answered our premises. Therefore, a three-dimensional paradigm (Figure 1) was constructed to include three psychological domains of learning, Pennsylvania's Ten Goals of Quality Education, and the content objectives for an Industrial Arts Middle School Curriculum.

Figure 1. Middle school curriculum model structure.



The paradigm is considered as a potential model for organizing educational objectives in terms of functions (Goals) and identifying processes (Domains) that are relevant to life-adjustment career behaviors. This approach was selected over the conventional method of identifying and listing subject-matter skill behaviors to cover in a course.

For the first objective, the committee decided to put meaning into each goal of quality education. The Goals of Quality Education were selected as the first dimension to the model in response to Act 299 passed in 1963 by the General Assembly of Pennsylvania. In addition, the 1971 Pennsylvania Department of Education's Standards for Approval of Secondary Programs states that, "There shall be a written body of objectives for the school which are consistent with the Ten Goals of Quality Education adopted by the State Board of Education."

Using the broadly-conceived description of each goal, the committee wrote narratives explaining the implications of each goal as it related to the industrial arts for the middle school. Content validity for each narrative was attempted during the summer of 1971. Ten groups consisting of five industrial arts educators in each group analyzed the narrative statements devised by the committee. Using the following criteria: meaningfulness, feasibility, relatedness to the learner, attainability, and practicality, each group checked the goal description for its content validity applicable to a middle school curriculum. All goals except number ten were accepted as devised by the committee. Goal Ten was revised to reflect the analysis submitted by the workshop participants. Thus, the first dimension of the model, product, or goals to be achieved was considered as the initial step in the development procedure.

The domains of learning (process) are psychological constructs deemed important in a school setting and thus form the second dimension of the model. Each domain is considered in its broadest sense.

The third dimension reflects the need for conceptualizing objectives of industrial arts in behavioral terms. Conceptualization would then provide the educator with a means of focusing his attention on non-cognitive domains of behavior as well as the cognitive behaviors. Such a system will provide our committee with an overview of subject matter content which might be compared and analyzed with respect to the domains in which they purport to modify behaviors as well as the goals expected to reach quality education.

SUMMARY

Before the emergence of the middle school, the junior high school was organized for the purpose of making a smoother transition from elementary to high school. Unfortunately, the junior high school often served as a mini-high school. This situation failed to help the pre- and early adolescent find himself in his new school situation.

For a long time, the term "middle school" has, for all intents and purposes, been a term within the educational realm. Many people have tried to give their views of the middle school. Some have simply changed the junior high school concept, while others have provided greater stimuli to developing interests of children by encouraging independent learning, educational guidance, and differentiated instruction.

The primary purpose of the middle school is to provide learning experiences that will produce the maximum development of each youth. Every middle school should provide varied opportunities for boys and girls to interact with the tools and materials which are a basic part of our technology.

To do this, the curriculum must be varied and flexible, with emphasis on child development related to perceptual-motor activities, cognitive and affective skills, and understandings conducive to goal-oriented behavior, rather than a set rigid amount of curriculum content. It must be considered that every adolescent learner is unique unto himself and that a set curriculum will not fit everyone. A child's mind should be regarded as an instrument for learning, rather than a warehouse for knowledge.

With the preceding in mind, the committee concluded there was a need for constructing a theoretical curriculum model for middle school pupils. It was the consensus of the group that the industrial arts program could serve as the core for the total middle school curriculum.

To facilitate the development of a Model Middle School Industrial Arts Curriculum based on the educational needs of the emerging adolescent, the committee decided to work under no constraints or limitations; i.e., building, facility, financing, staff, present and past curricular program.

The first task that was ahead of the committee was to collect relevant information about the learner and from this develop a list of learner characteristics. The second task was that of revising Pennsylvania's Ten Goals of Quality Education to meet our own needs. The final phase was to develop a curriculum model matrix which established the Ten Goals of Quality Education as its base.

While it might be fair to say that industrial arts related formerly to remedial programs for retraining individuals in adjusting to life-skills, the major trend today is to conceptualize educational programs in industrial arts by emphasizing changes related to goal-oriented behavior. As a student in an industrial arts program develops a degree of motor skill, he progresses in the intellectual and feeling processes as well.

The task of developing units for instruction relating the learning process (domains) to the product expected now (Goals of Quality Education) lies ahead for the committee.

Dr. Bernabei is the Assistant County Superintendent, Bucks County Schools, Doylestown, Pennsylvania.

The Role of the Student in the Industrial Arts Environment

John Lavender

Occupational Versatility is a Title III, E.S.E.A. project designed to advance creativity within industrial arts education. It has been funded under public law 89-10 since August 1969 and is now in its third year of operation, with pilot programs in three western Washington school districts.

The Metropolitan Area of Seattle Industrial Arts Consultants is the sponsoring organization. More widely known as MAIAC, this organization includes 46 school districts within King, Pierce, Snohomish, and Kitsap counties. These counties are located in the Puget Sound region, the most densely populated area in Washington State. The Highline School District in suburban Seattle serves as the local educational agency (L.E.A.).

The first year of operation, the planning period, was used to design the systems for the pilot programs and to prepare participating teachers and their laboratory facilities for testing the systems. The second year, the initial pilot period, was used to test the program and to modify and revise as was needed. The third year, 1971-72, is now in operation, with the major emphasis being measurement of the program's educational value for students.

To illustrate the Occupational Versatility program, four developmental categories will be described. The first is a student needs assessment as determined by the Occupational Versatility staff, teachers, and the MAIAC group. This is followed by the student objectives that were derived from these needs. Third will be the procedures which are being used to meet the objectives, and fourth is the evaluation of the program's effectiveness.

NEEDS ASSESSMENT

Occupational Versatility developed, as do many innovative projects, from the frustrations experienced by industrial arts teachers. The conventional methods were not seen by the teachers as doing a satisfactory job for the students.

It was suggested that if attention were focused on both the learner and the ways in which he learned, it might be possible to find better ways to teach. The major objective, then, should be to help students learn in the industrial arts environment and not to teach industrial arts to students.

With this focus as a design base, the next step was to identify "what teachers should know about the learners when they enter the program, and what changes in behavior are desired upon exit." Such exit behaviors—attitudes and abilities—are what the student objectives were designed to meet.

"Occupational Versatility" was the term selected to identify the sum of the characteristics the student would exhibit by the time he completed the program. To be occupationally versatile, a student would:

- be able to work independently in the industrial arts facility, utilizing those resources available to him;
- develop a mode of operation that best suits his desires and abilities;
- be responsible to himself and to the society in which he works;
- become confident in his abilities, satisfied with his accomplishments, willing to be challenged, and capable of changing;
- be able to give consideration to his future and to use available information in making decisions.

This, then, became the challenge—designing an educational environment in industrial arts laboratories whereby students could develop these attitudes and abilities which would enable them to be occupationally versatile.

OBJECTIVES

The primary objective for the student is to "find his role in the industrial arts environment and have the opportunity to develop the abilities of self-sufficiency, productivity, and adaptability."

To accomplish this objective, the student is encouraged to:

1. Select the area in which he wants to work, elect the project he wishes to produce, make the project, and evaluate the results;
2. Manage his activities in the shop. (This includes being responsible for attendance and time utilization, material purchases, project planning, performance records, and facility maintenance);
3. Instruct himself in planning procedures, material changing processes, and tool and equipment usage;
4. Investigate career opportunities and make judgments about these with consideration to his own abilities and interests.

These experiences occur under the guidance of an instructor—but not by the direction of an instructor. The instructor is the facilitator of the learning, while the student is the director. The instructor is a resource for the student to call upon for assistance and counseling; the student is the manager of his activities. These roles are different than they were before, but are considered to be essential to facilitate the desired student growth and development.

PROCEDURES

The personalization of the program, with each student entering the shop as an individual, setting his own goals, and working toward them at his own pace, was determined as the key to meeting the student objectives. To permit students to work independently on their own interests necessitated six other methodological changes. These changes occurred in the following areas:

Facility Design

The separate unit labs for wood, metal, and drawing were remodeled into a large, single-room, general shop. Three teachers were teamed together as instructors in Chinook and Keithley Junior Highs and two in McKnight Middle School. Activity areas were expanded so the program could offer experiences in woods; plastics; power; electricity and electronics; bench, sheet, art, and machine metals; forge and foundry; arc and gas welding; graphics; planning and drafting; general industries including construction, manufacturing, masonry, glass, tile, etc.; crafts; and career guidance.

Each area is self-contained and is organized with open storage, making all tools, supplies, instructional materials, and project samples readily available to the students. Planning areas and necessary power equipment are easily accessible.

All areas are color-coded for easy maintenance, and all tools and materials are labeled to make them readily identifiable. Machines are also color-coded, to national standards, to facilitate improved operational learning.

Student Management System

When the student enters the shop, he picks out his notebook, which is numbered and color-coded to the period in which he is enrolled. The office girl takes attendance by checking the notebook book case; notebooks remaining in the bookcase indicate the student is absent that period.

The student takes the notebook to his work area, which insures that it is always near at hand for his use and for student-teacher conferences. This is an essential feature of the program in facilitating student-teacher relationship.

Within the notebook, the student maintains his attendance record, materials purchased record, performance record, and power equipment usage record on the forms provided. He also keeps all his plans and procedure records in the notebook.

This system serves as a catalyst between the student and the industrial arts facility. It helps to provide much of the guidance necessary for independent student action.

Self-Instructional System

The student is charged with the responsibility for instructing himself in any process, procedure, or tool or machine operation he needs or desires to learn. He may call upon a wide variety of information resources to assist him. These resources include loop films, cassette tapes, film strips, charts, instruction sheets, and other students.

The teacher's role, as an information resource, is to be the last resort if all else fails. The teacher also checks efficiency of students' self-instruction, such as on power machines, to see if learning is thorough and accurate. Finally, he is also an observer, who may offer suggestions as needed or requested.

Non-Graded and Ungraded

Students from all grade levels (7, 8 & 9 or 6, 7 & 8), boys and girls, beginners and industrial arts veterans, are mixed together to form a heterogeneous class. This makes for an excellent cooperative learning situation among students.

The students receive course credit, but no grades. They maintain a performance record which they use in the program, take home as a reporting instrument, and carry on into their high school industrial arts programs.

Teaming Activities

Students are encouraged both to work independently and to team together. They may set up assembly lines and mass produce, they may pursue construction activities, or they may focus on individual projects and learning experiences which are of interest to them.

Systems have been developed to assist the students in their teaming activities, although the students themselves must determine the number on a team and the operations which each will perform; the system provides them with guidance and general structure.

Career Guidance

All activity areas in the lab, including career guidance, are self-instructional. These areas generally are needed or desired by the student before he performs in them.

The guidance area has two large boards with over 300 careers listed on them. These boards are an easy-to-use directory to books, catalogs, films, and tapes which can provide the student with information on careers.

The student, it is hoped, will become interested in gaining information about careers or future employment related to areas in which he has worked. At this time he may come to the career guidance area to gain this information regarding the careers of his choice.

EVALUATION

Evaluations were conducted during the pilot year to determine if the system was functional and if students, teachers, parents, and administrators were satisfied with the change. The data was positive in regard to both of these aspects. Students can and will manage their affairs and can and will instruct themselves. Their efficiency in both these areas was better than 90%. The teachers were called on only 11% of the time for instruction in Occupational Versatility, as opposed to 68% in conventional industrial arts programs.

The teachers in the program believe in its methods, and 87% of the visiting educators were positive in their evaluation. Parents and administrators were almost 100% positive in their acclaim. But most important were the students; 117 out of 123 professed a strong desire to continue the program.

Jack Starr, a doctoral candidate at Oregon State University, conducted a study on the problem-solving attitudes and problem-solving abilities of the Occupational Versatility students at Chinook and two control schools with conventional industrial arts programs. Both groups were equal in early September, but by June, the Chinook students evidenced significantly superior problem-solving abilities and somewhat more self-confidence.

This study is being replicated, and seven other studies are being conducted this year to determine if this pattern continues and if the other aspects of student performance and attitude show positive growth. These studies will be completed by July 1972. At this time, a manual will have been prepared for teachers wishing to incorporate part or all of the system into their industrial arts programs.

The Project staff and teachers wish to reserve final judgment until all studies are complete. At that time we hope to be able to say "we know this is a better way" and not just "we think this is a better way."

Mr. Lavender is the director of Project Occupational Versatility, Highline School District, Seattle, Washington, 98168.

Student-Oriented Industrial Arts

Clarence L. Heyel

The concept of student-oriented curriculums is not really new. However, during the past several years industrial educators have been taking a hard look at student needs, learning methods, and a variety of approaches to teaching industrial arts. The traditional approaches requiring every student to produce predetermined exercises and projects is giving way to such concepts as problem solving, open space classroom arrangements, brain-storming, systems approaches, learning packets, independent studies, and contract methods. Students at various levels are experiencing seminars, group activities, leadership roles, and decision making along with the accomplishments of technical and psychomotor skills. The so-called "ing" curriculums such as metalworking, drafting, printing, and woodworking, etc., are succumbing to the concentrated efforts of study of industry and technology to include communications, manufacturing, production, and transportation.

Dr. John Dewey in 1899 wrote in the School and Society of the need for student orientation in the study of occupations. He stated:

> In an informal but all the more perversive way the school life organizes itself on a social basis.
>
> Within this organization is found the principle of school discipline or order. Of course, order is simply a thing that is relative to an end. If you have the end in view of 40 or 50 children learning certain set lessons to be recited to a teacher, your discipline must be devoted to securing that result. But if the end in view is the development of a spirit of social cooperation and community life, discipline must grow out of and be relative to such a name. There is little of one sort of order where things are in process of construction. There is a certain disorder in any busy workshop, there is not silence. Persons are not engaged in maintaining the certain fixed physical postures. Their arms are not folded, they are not holding their books thus, they are doing a variety of things and there is no confusion or bustle which results from activity. But out of the occupation, out of doing things that are to produce results, and out of doing these in a social and positive way there is both a discipline of its own kind and type. Our whole conception of school discipline changes when we get this point of view. In critical moments, we all realize that the only discipline which stands by us, the only training that becomes intuitive, is that received through life itself. That we learn from experience and from books and through the sayings of others only as they are related to experience are not mere phrases. The school has been so set apart, so isolated from the ordinary conditions and motives of life that the place where children are sent for discipline is the one place in the world where it is most difficult to get experience, the Mother of all discipline worth the name.
>
> Experience has its geographical aspect. Its artistic and its literary, its scientific and its historical sides, all studies arise from aspects of the one earth and one life lived upon it. We do not have a series of stratified earths, one of which is mathematical, another physical, another historical, and so on . . . the problem is to unify, to organize education to bring all its various factors together through putting it as a whole to organic union with everyday life.

This seems to indicate that 73 years ago John Dewey made an attempt to make the school a part of the society in which the students lived and to permit the student to gain experience in solving some of the everyday problems. On the back cover of the December 1971 "Phi Delta Kappan," the following letter submitted by William C. Miller, Deputy Superintendent, Wayne County Intermediate School District, Detroit, Michigan, was published. It was supposedly from Edsel Memorial High School and dated August 1, 1971. It read:

Dear Parents of Our Graduates:

As you are aware, one of your offspring was graduated from our high school this June. Since that time it has been brought to our attention that certain insufficiencies are present in our graduates, so we are recalling all students for further education.

We have learned that in the process of the instruction we provided, we forgot to install one or more of the following:

—at least one salable skill;
—a comprehensive and utilitarian set of values;
—a readiness for and understanding of the responsibilities of citizenship.

A recent consumer study consisting of follow-up of our graduates has revealed that many of them have been released with defective parts. Racism and materialism are serious flaws, and we have discovered they are a part of the makeup of almost all our products. These defects have been determined to be of such magnitude that the model produced in June is considered highly dangerous and should be removed from circulation as a hazard to the nation.

Some of the equipment which was in the past classified as optional has been reclassified as standard and should be a part of every product of our school. Therefore we plan to equip each graduate with:

—a desire to continue to learn;
—a dedication to solving problems of local, national, and international concern;
—several productive ways to use leisure time;
—a commitment to the democratic way of life;
—extensive contact with the world outside the school;
—experience in making decisions.

In addition, we found we had inadvertently removed from your child his interest, enthusiasm, motivation, trust, and joy. We are sorry to report that these items have been mislaid and have not been turned in at the school Lost and Found Department. If you will inform us as to the value you place on these qualities, we will reimburse you promptly by check or cash.

As you can see, it is to your interest, and vitally necessary for your safety and the welfare of all, that graduates be returned so that these errors and oversights can be corrected. We admit that it would have been more effective and less costly in time and money to have produced the product correctly in the first place, but we hope you will forgive our error and continue to respect and support your public schools.

Sincerely,

P. Dantic, Principal

While this letter was based on the paradigm that many faulty automobiles are produced and individuals frequently receive communications from the factory asking to return the vehicle to the dealer so that the defects can be corrected, the school system does not operate in such a manner. We must institute new teaching strategies to affect individual thinking, problem solving, decision making, and the social efforts.

Some of the professors at Glassboro State College and individuals in the nearby school districts are attempting to institute such programs. I would like to discuss several of these with you at this time.

The creative problem solving approach to industrial arts is emphasized through the use of structured, yet open-ended problems. Mr. C. Samuel Micklus, an industrial designer on the staff in the Department of Industrial Education and Technology, has used this approach since he started teaching at this college four years ago. While he has designed numerous problems for the students to solve, several seem to stand out. One required the student to execute a half-mile course on a lake not far from the campus. The expenditure limit was set at $5.00 or less. Student motivation was high, and time spent on solving the problem meant little to those engaged in the undertaking. All necessary precautions were taken, including safety jackets and a safety patrol.

The result was that one student designed what I believe to be a salable product. It was a snap-together cardboard boat. This he accomplished after much research, experimentation, and trial. Another student designed a one-man craft powered by a 12-volt generator. Others attempted to walk on polystyrene shoes. According to a recent news release in the Philadelphia Evening Bulletin, a Naval officer has perfected this technique. Needless to say, this course, which is open to all students, has no trouble filling. We offer four sections of this course each semester and turn students away.

Students in this class interact with one another, assist each other in solving individual problems, are faced with design functions, and are introduced to the use of tools, machines, and equipment.

Another problem designed to use industrial materials and processes involves the use of aluminum castings. The design is made by the student out of styrofoam. Girls as well as boys pour the castings in our metals laboratory. The styrofoam is replaced by the aluminum as those of you who teach metals readily realize. There is no one design preference, and students and professor discuss the pros and cons of their castings in a seminar session. One of the latest problems designed by Mr. Micklus which is used to create student motivation and enhance career activity and enthusiasm is the construction of a device to execute a predetermined course. The device would have to carry your own weight. The vehicle cannot have traditional wheels, and the person's body cannot come in contact with the ground. While the results are not yet completed, I have seen some odd-looking devices being constructed as students weld metal frames, design and construct cylinders, and discuss the so-called solutions.

Another problem solving situation is one used by Mr. Leigh Weiss, power mechanics instructor on our staff. It is designed to involve the community and assist those who are working with handicapped individuals. Students in this class work with a Cerebral Palsy Center. They must study the individual problem of a particular student and design devices so that these children can effectively exercise, use their limbs, ride kiddie cars, and even eat a sandwich. Motivation in this class has been high, and the rewards have been phenomenal. We have received calls from other similar institutions in the community served by Glassboro State College for assistance in this particular program.

The open space concept which I would like to discuss briefly with you is one which is used in many schools in New Jersey. As you may recall, Miss Elizabeth Hunt instituted the Technology for Children Program in New Jersey several years ago. This particular offering is for individuals from kindergarten through the 6th grade. At this time, Dr. Fred Dreves is the director of the Technology for Children Program in the State Department of Education in Trenton. Through the cooperation of the colleges in New Jersey, he has been able to offer this program to at least 580 teachers in the state. The program is based on the open classroom concept and permits the children in these grade levels to experience various episodes evolving out of a series of learning centers in the classroom. For instance, students might have a learning center revolving around food processing, photography, language arts, mathematics, science, to name a few. We have hired a number of co-adjunct staff to assist us in implementing this particular program in numerous schools in the South Jersey community.

Students in this program may use tools and materials for constructing devices of their interest. They may also use closed circuit television, printing presses, plastic molding devices, silk-screen printing techniques, cameras, calculators, typewriters, etc., as they experience the use of the technological devices in our society.

In talking with one teacher who has used this approach in one of the schools, he found that rather than having a predetermined amount of time which each student would spend in a particular area, it was more feasible to permit each student to work at his own rate and attention span. I am sure that there was some bustling, confusion, and disorganization which the average observer would see. However, the student motivation and interest level seemed to be quite high. Those of you who received issues of Life magazine perhaps read about the use of the open classroom as a concept in elementary education. I observed one workshop for the Technology for Children Program where one teacher presented the idea of using a Dremmel saw so the students might cut their crossword puzzles from cardboard or thin veneer stock. They would then take the pieces and place them in an arrangement which would assist the student in developing mathematical concepts. Another teacher in the same seminar presented the idea of learning new technical terminology regarding aircraft and the study of flight. Students, however, were challenged to design and construct their own aircraft while they studied the terminology and experimented with the idea of lift, drag, and pitch.

Mr. Adam Pfeffer, an industrial arts teacher at Beck Middle School in Cherry Hill, New Jersey, has been using learning packets and independent study with a high degree of success. I visited this school to observe some of the activities which were taking place. I witnessed a study of the food processing industry which involved the Art Department, Home Economics Department, and Industrial Arts Department. Students in this program mass-produced candy in quantity, devised their own packaging designs, and packed their own candy while using the community as a resource center to study the opportunities and careers in the retail food industry.

Another approach used at the same school required the students to design a modern, contemporary package for shipping eggs. Each student was to design a package which could be dropped from a predetermined height and not create sufficient shock to break the eggs. Needless to say, not all students were successful in their approaches. However, we know that success is not permanent, and the same is also true for failure.

While the contract method is not new to industrial educators at the higher education level, this approach does not seem to be used as frequently in the elementary, middle, or high schools. However, I have had an opportunity to review the records which were kept by individuals in an independent study or contract method approach which was used at the same middle school. From what I was able to gather from the records kept by individuals and the reports of the teachers, the majority of individuals in this program were successful. Out of approximately 25 reviews which I read, it seems that only 1 or 2 did not complete the contracts as specified initially. This approach was used regardless of learning level and student ability. Again, motivation and self-direction along with decision making appeared to be the prime factors, and students completed their work with a high degree of success. One industrial arts student produced a sequential rocket firing device which he himself designed and constructed. The device permitted 7 rockets to be fired simultaneously or in sequence. Students, therefore, not only experienced the contract method but also became involved in research and experimentation.

We at Glassboro State College are just beginning to experiment with the brainstorming technique and the use of learning packets. We have had independent study offerings since the department was instituted 6 years ago. This semester we carry approximately 32 students in independent study problems. Not only are these in the area of curriculum design, but they permit the student to gain technical expertise in the particular area of his choice. Again, the contract method is used so the student and the professor agree that a certain amount of work will be accomplished for a predetermined number of credits.

The brainstorming technique has been used to supplement the professor's class syllabus. The structure of a brainstorm session requires that a predetermined length of time be established, such as 5 to 10 minutes, so that students may elicit responses to particular questions. For instance, the questions might be: what are some of the aspects that you would like to study or gain from this particular class? The responses are not evaluated or discussed during this particular time. Once the time limit has been reached, the class and the professor agree on the elements which may be included or removed from the class content. Students then volunteer to accomplish research and report to the class their findings. At this point, it appears to be quite successful, since it permits the students to become active in part of the class and determine some of their own goals, input, and activities.

Systems approaches and learning packets have also been used to introduce students to this particular concept. A number of learning packets have been produced by graduate students and they, too, have produced a series of learning systems. The use of a system includes the areas of micro-teaching, verbal and non-verbal communication, and videotaped and programmed instruction. However, it cannot be limited to these particular areas. Some graduate students have produced learning packets where the student may receive information at his own rate while studying his particular topic. Others have produced a hands-on learning device which permits students to calculate the use of board feet while following preprinted instructions and assembling and disassembling various boards which were precut so that students could visualize the various techniques of calculating board feet. Other learning systems were used so that students might become familiar with ohms, amps, resistance, and the meters necessary to read these directly. A console was designed, and preprinted instructions for measurement and adjustment were also included. These seem to be quite effective when used with students at the junior and senior high school levels.

From the type of instruction and learning strategies that we have become familiar with, it seems that one should follow the advice of Ralph Waldo Emerson when he said "the secret of education lies in respecting the pupil."

Dr. Heyel is the Chairman of the Department of Industrial Education and Technology at Glassboro State College, Glassboro, N.J.

ABLE Model Program

Walter Wernick

Our mission is to develop an instructional model, a theory of practice for elementary school teachers.

We want teachers to think of The World of Work as an Organizing Center for the Curriculum of the Elementary School. That's the title of our project proposal, and it expresses the centripetal thrust of our energies. We want teachers to think of adult lives as vehicles for their regular instructional program.

Which adult lives? Why, the person-in-the-occupation, of course! We want teachers to imagine occupations as starting places for instruction. We want teachers to think of authentic people—alive, relating to themselves, their work stations and their communities. Our modest proposal is that a working human being can be an organizing center for instruction of many of the usual academic skills. In this way our organizing center contributes to career development. We believe that once teachers think of personalized occupational information as significant, legitimate content, they can and will organize plans around people.

We've seen that once teachers think of developing attitudes toward life careers as an important goal, they can arrange activities wherein children can uncover and discuss their needs, interests and abilities . . . in expressive, sharing activities.

Also, once teachers think of particular performance skills for children, such as learning to interview adults about the work they do, they can plan so their children become more independent. Teachers know that inquiring from primary sources in their own communities gives children the advantage of role identification directly within their contemporary culture.

In essence, our main focus is in working with, through, and for the imagination of the elementary school teacher. We set up the design of our project so input and output are researched within one primary element—the decision-making professional teacher.

THE WORLD OF WORK AS AN ORGANIZING CENTER

About 50 teachers have been thinking with us since July 1, 1970, when we began. Some are soaring on the wings on an individual progression philosophy. Some are team teaching. Some are in multi-age cluster groupings. Some are in open schools built around learning centers, and some are in self-contained traditional classrooms.

For all teachers within this spectrum, we're providing a focus for their energies—their thinking energies and their performance energies. We're working within an imaginative form that is becoming common to all. The World of Work as an Organizing Center for the Curriculum of the Elementary School is enabling communication and criticism among probationary teachers and old pros, college people and public school people—even lay advisory committees and children have been contributing to our model, too!

Our form encourages communication about what teachers are able to do. It also suggests management techniques that increase the effectiveness of instructional efforts. Separate lessons and units are no longer isolated from each other. They're becoming integrated with life. Through people-centered activities, knowledge is being made relevant and usable. Teachers can see and use hierarchies and priorities where before they felt used and abused by schedules and subjects.

Teachers appreciate this clear call for a basic look at life. We've noted many comments such as, "The thing I like is how much I'm learning while the kids are learning!"

Our teachers are motivated—and the children benefit from the added energy and expertise they bring. With direct experiencing and quick, responsive feedback of learning progress, teachers say they're more productive.

Could the organizing center concept be focusing their thinking and helping them to be more effective? We think so. Let's look at this concept of an organizing center to see what it's doing for us and how we suggest it work for teachers.

A FORM FOR THE ORGANIZING CENTER

The concept of an organizing center is not entirely new. However, combining it with Authentic, Basic, Life-Centered Education brings process and content together to fashion a powerful teaching instrument for the 1970's. As we see it, this instrument, the organizing center, has three dimensions of thinking emanating from one central point.

Anything can be used as the point. You can start with anything to begin thinking about teaching—an idea, a skill, an activity, a thing—anything as long as you and your students have a common place to stand, a common beginning, an interest to be shared and explored together.

Our strategy is to use the idea of an organizing center as a point to begin. Then we suggest the person-in-the-occupation, the living adult, as a viable nucleus. If this beginning is accepted as reasonable and positive, and it is by classroom teachers in a wide variety of teaching environments, we can build out from there.

We start and go with people-centered activities. We feel concrete, direct experiences have to build the base until the logical progression of abstract subject matter becomes infused with the active life of the child.

What of children's interests and the traditional, established disciplines of knowledge? They mix in our emerging curriculum, of course, but only after real, tangible experiences have been set with and for the child. All throughout this process of cooperative planning, the teacher is the guide, the manager, and, most important, the responsible agent of the people-centered organizing center. The humanizing element of teaching has to be kept in focus.

For a practical example, let's imagine we're planning for a group of children about nine or ten years old. Through our systematic parent communication program, an integral feature of our total plan, we have an inventory of parents' hobbies, travels and occupations in a ready file. By frequent, overt communications, we've invited the parents to join with us in increasing the community resources and talent available to the class. Our last effort was to send a letter home explaining goals and describing activities we are about to follow.

Let's use a bank employee as the nucleus for our form and think like a teacher. In imagining what we may do in our classrooms, we'll employ the same dimensions of thinking participating teachers in ABLE Model Program have been able to test and refine.

Our first question is, "What materials and services are available to the children?" In exploring resources, we have to think of time, places, people, and space for activities. In other words, our inquiry is to find "what will be within my teaching domain for imput?" In this example, because of local resources, we're starting with a person working within a bank and going on to other significant elements from there.

We call this dimension of thinking accessibility. What is accessible for the teacher and child? Surely, every classroom teacher has thought this way. Our research and development efforts are shaping this thinking into a clear, communicable form.

The second dimension of our "new" form is a corollary of the first. Here, we ask, "What do we want our children to do?" We want overt behavioral goals—performance—visible activities. We want to see and share, and we want children, parents, and the public to see the products of learning, too.

Learning by doing is an old song. We want to play it with teaching instruments so the music is loud and clear. We want oral and written reports, role-playing, murals, class newspapers, interviewing, tapes, letters, movies, slides—all open and auditable.

Our provision for accountability is not just because of program budgeting. It's because children need to see visible progress to keep on learning. Classroom teachers know successful performances fuel further generative efforts.

Passive learning activities cut down learning power and turn real life into inert matter. This second dimension of thinking about what to do as a teacher, we call it accomplishment, helps to identify and evaluate performance. In this case, children should be able to express their learning about money, credit, loans, and other relevant contemporary banking procedures—in proper terminology, language, and pictures that display understanding of the development of the technology of banking.

Children should be able to perceive the duties of various bank employees and describe how these people see their work as it relates to themselves, their families, and their communities.

Oral or written evidence of a student's respect for people can be easily obtained; that is, if such a behavioral objective is planned by the teacher.

A third dimension grows naturally from our previous thinking and begins to technify what should be taught. Elements within this area of professional concern are usually considered as knowledge, skills, and attitudes.

The selection of what should be taught (content) has often been left to those who write curriculum guides or those who juggle subjects and time schedules. Our strategy is to highlight this important function by putting the teacher's judgment right in the middle of the plan. Our approach requires the teacher to juggle ideas.

We advise teachers to follow an idea and see where it leads them. We're not afraid of ideas which jump into vigorous relationships with other ideas. In fact, to heighten the inherent activity of ideas, we've labeled this dimension of thinking mobility. Thus, accessibility, accomplishment and mobility make up the three basic elements of our organizing center.

Children need content that is active. To work with active learners, teachers need ideas that move. Since the person-in-the-occupation has great generative powers, Authentic, Basic, Life-Centered Education has built-in motivation, built-in mobility, and built-in management.

Those who manage ideas by pigeonholing them within isolated subjects think little of our teaching powers. As teachers, we need room for thinking, freedom to teach. We need to be free to follow responsible ideas and direct responsible activities. Our organizing center, a life in process, provides not only the focus, but also the free space to plan.

THE CONTENT OF OCCUPATICNS IS LIFE

Studying the person-in-the-occupation moves ideas naturally and relatedly through several areas rich in content. In our planning, history, geography, technology, language, and human relationships are not cut up and covered in the traditional sense of scope and sequence. Rather, these fields of knowledge are used as a background grid, as benchmarks—not as a fact sheet to be spun out by a computer and spit back by a compliant child. Studying the lives of people leads to serious inquiry into how people act like human beings—or should.

We are blessed with a magnificent start. Our young, everywhere, are actively seeking life. Let's get them together with authentic adult roles. Let's help them to feel the evocative pull of people in real-life occupations and activities. Let's feed their passions with positive experiences of what they can expect and do.

Our research shows that children can find out how other people's occupations influence the activities of their lives. In doing so, they find out what work is and how the World of Work might shape their thoughts, abilities, attitudes, interests, and future. In a very real sense, they're finding out about themselves as people.

People! The process of becoming! Transforming budding ideas and direct experiences into quality learning activities! Within the dimensions of a teacher's imagination, if these life-centered elements can be perceived, they can be organized and made operational right away.

By managing the dimensions of accessibility, accomplishment, and mobility, a teacher can influence a child's inherent drive to become. As the teacher widens a child's kaleidoscope of potential interests, that great instrument of human development, the self-fulfilling prophecy works to build a positive self-image for the child. What content is of more profound worth than that?

Those of us developing ABLE Model Program believe the World of Work Can Be An Effective Organizing Center for The Imagination of The Teacher in The Elementary School. We think the imagination of the teacher is the curriculum of the elementary school.

What do you think?

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Specifying Objectives for Industrial Arts in the Secondary School

M. Duane Mongerson

In the past few years, efforts by curriculum developers to improve instructional programs have been directed toward the stating of objectives in behavioral terms (Alexander, 1971). A number of educators including Mager (1962), Tyler (1970), and Popham (1971) have advocated the utilization of a behavioral base in the assessing of student progress. However, some educators such as Ebel (1970) have been critical of these efforts.

Recognizing the divergent views expressed by educators in terms of behavioral objectives, two studies of the effectiveness of behavioral objectives in monitoring instruction in secondary school industrial arts courses were undertaken.

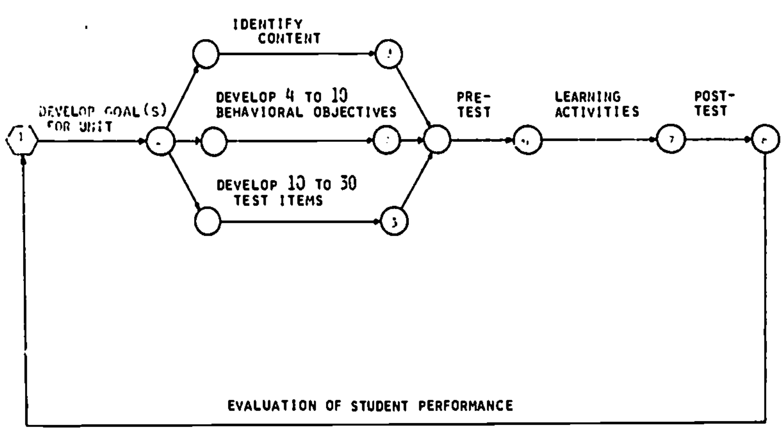
ANALYSIS OF AN INSTRUCTIONAL UNIT

Forty-two students, including boys and girls at the State University College at Buffalo's Campus School, were selected to participate in the study of the effectiveness of using behavioral (instructional) objectives in the teaching of a unit on quality control. For the study, the 42 students were randomly divided into three groups.

Experimental Group I was given a list of behavioral objectives and presented with a lesson on quality control in the production of a product. Experimental Group II was taught the same lesson; however, they did not receive the list of behavioral objectives. The Control Group was not taught the lesson on quality control, nor did they receive the list of behavioral objectives. In Figure I, a unit instructional monitoring system is presented. Figure I represents the procedures utilized for Experimental Group I. Even though the treatment varied among the groups, each group was administered a Pre-Post test.

FIGURE I

UNIT INSTRUCTIONAL MONITORING SYSTEM



RESULTS

When the three groups were compared by DePue (1971), only Experimental Group I, which was comprised of students who received the list of instructional objectives, was significant (at the 0.05 level of confidence). An analysis of covariance was used to determine the difference among the groups. The mean scores for each of the groups are listed in Table 1.

TABLE I

SUMMARY OF STATISTICAL DATA FOR AN INSTRUCTIONAL UNIT

	Test	Number of Students	Mean
Experimental I	Pre	14	11.07
	Post	14	13.64*
Experimental II	Pre	12	10.00
	Post	12	12.17
Control I	Pre	14	10.29
	Post	14	10.14

*<0.05

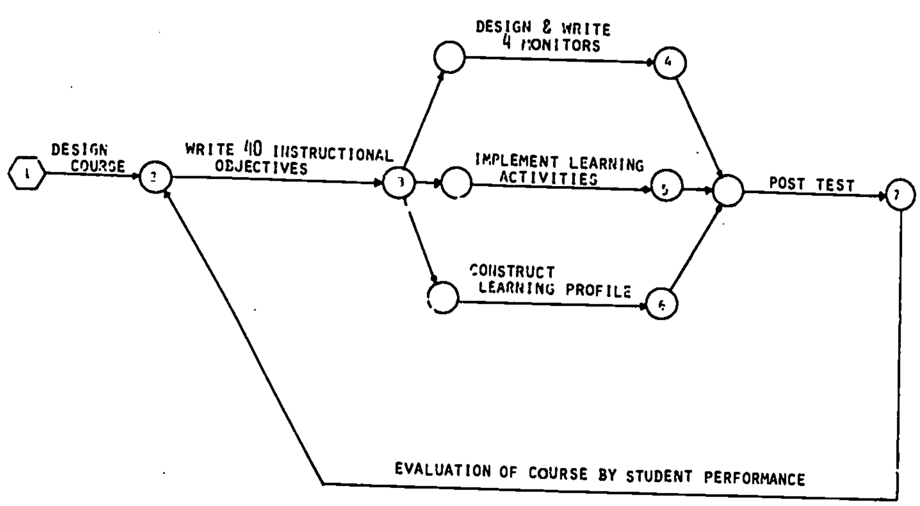
ANALYSIS OF A SEMESTER COURSE

In Study II, the effectiveness of behavioral objectives was analyzed on the basis of a semester's work in an industrial arts course. A total of 38 seventh grade male students participated in the study. Two experimental groups and one control group of students were selected. A brief description of the groups is as follows:

Experimental Group I consisted of 11 students from the State University College at Buffalo's Campus School. These students were presented with a list of 40 instructional (behavioral) objectives and were subjected to a simulated production experience in which they had the opportunity to participate in role playing activities in organizing a managerial structure to design and produce marketable products. Plastics and woods were the primary material areas used in the production of two different products. In Figure II, the instructional system design which was utilized during the semester is presented.

FIGURE II

SEMESTER INSTRUCTIONAL MONITORING SYSTEM



Experimental Group II consisted of 14 students from West Hertel Middle School in Buffalo. The primary focus of Group II was upon custom manufacturing in the material areas of woods, plastics, and ceramics; however, a unit of study was devoted to the mass production of a product. Group II did not receive the list of instructional objectives.

The Control Group consisted of 11 students from the State University College at Buffalo's Campus School. This group did not receive the list of 40 instructional objectives, nor were they exposed to an industrial arts course.

RESULTS

An analysis of covariance was used to measure the results of the Pre-Post test scores (see Table II). When each of the groups was compared with one another, only the Experimental Group I which was presented with a list of 40 instructional objectives significantly (at 0.001 level of confidence) out-performed the Control Group and the Experimental Group II.

TABLE II

SUMMARY OF STATISTICAL DATA FOR A SEMESTER COURSE

	Test	Number of Students	Mean
Experimental I	Pre	11	11.82
	Post	11	25.09*
Experimental II	Pre	15	12.27
	Post	14	13.35
Control I	Pre	12	11.00
	Post	11	11.45

*<.001

CONCLUSIONS AND RECOMMENDATIONS

Although the stating of instructional objectives in behavioral terms can be viewed as a time-consuming task, it is an imperative evil if one is to be objective in assessing a daily, a unit, or semester instructional plan of learning experiences. Too frequently, only a subjective assessment of a learning activity is made by the educator or laymen. The utilization of the instructional objective in the planning, implementing, and evaluating of a program of instruction reflects the trend toward accountability in educational systems. Fortunately, it is early in the behavioral game, so each of us still has an opportunity to take a good hard look at the potential of the instructional objective.

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Implementation of a Middle School Industrial Arts Program

Charles E. Campbell

If one is to implement a program at any level, there are a great many questions which need to be considered. In the area of technology, what has been the history of the technological movement in education? What has been and is now the charge of education and educators? What have been some significant social influences on education? What are some of the distinct characteristics of the learner? What are the directions that education should consider, particularly in technology at the middle school, to prepare students for the future?

Industrial education has a past which has been sparsely populated with so-called educational innovators and/or leaders. Of these few, still fewer are likely to be recalled because of their contributions to education. We find the list narrowing significantly when we speak of technology and education.

Technology has been defined as "systematic knowledge and action, usually of industrial processes but applicable to any recurrent activity" (12, p. 401). I prefer to define technology as the empirical use of knowledge.

Technology, in the past, has often been described as the accepted way of doing, otherwise known as technique. Due to the near lack of communications, new and improved techniques suffered immeasurably from localization. It has been because of this localization that today we are beginning to realize many of the problems created by "technology."

Our early scholars and researchers in education, Francis Bacon, John Locke, and John Pestalozzi, did not concern themselves with technology as we know it today. These men were interested in involving children in real experiences, what they termed the "Manual Arts."

Fellenburg was the first to really vary his pedagogy from his predecessors, inasmuch as he seriously considered the environment of which the child was a member.

We have been introduced to many significant movements in our field, such as the "Russian System of the Mechanical Arts" and the unit shop. This soon gave way to the Sloyd of Scandinavia. Sloyd was different from the Russian System in that it was designed for every child as a part of general education. The Russian System can only be described as the training of skillful and intelligent mechanics. This might be compared to today's dilemma that exists between vocational or special education and industrial arts and studies in technology in general education. Sloyd was an individual system for learning, not a mass-production system of general education.

In 1880, the St. Louis Manual Training School was established at the secondary level. This was the first time that industrial education had ever been formally recognized in a special school in America. This type of school was to become accepted and eventually provide a better-prepared individual to enter into society. This filled an educational need in a developing country.

In 1900, few cities or towns had these shools. The United States was still a country without a network of reliable, passable roads. The Wright Brothers were experimenting and finally flew 120 feet at Kitty Hawk. Jerome Kern and the theater were just becoming popular. Theaters were being built across the land. Until then, entertainment had been limited to the box social and the local dance hall belles. Light opera was beginning. Literature was also beginning to have an effect on the society, with such works as Upton Sinclair's writings on the meat packing houses in Chicago in The Jungle. Theodore Dreiser's Sister Carrie brought out the importance of the needs and desires of the times to escape from poverty and improve living standards.

The one-room "Little Red School House" was built of necessity in the back country. It was designed to provide only the academics, as the homestead provided the mechanics.

About 1920, the one-room school began to be vacated, and the student went to town to school. This was the result of Henry Ford and his magnificent Model-T. With the Model-T the demands for more and better roads were satisfied. Scientific management methods were beginning to make known some directions of management. Conveyance of work to and from the worker was accepted as a necessary element of production. The theory was adopted that to increase productivity all that was necessary was to divide the work and multiply the output. Mechanization was to become accepted practice in industry.

The 1920's came roaring in as a result of all of the preceding plus the fact that World War 1 was really over. The working man, for the first time in history, had more money than he needed to feed, shelter, and clothe himself and his family. His life was easier, and he had a new romance—the Model-T. There was also time for one to enjoy some of the finer things in life such as the works produced by Jerome Kern and Cole Porter. People were reading works by Hemmingway, Steinbeck, and Sandberg, in addition to Scott Fitzgerald's The Great Gatsby, all of which were questioning and weighing American values.

We saw the birth of many new universities during this time, also as a result of better roads and communications. There was indeed a new demand for a broader, more qualified person in leadership roles in this country.

The 1930's were ushered in with a depression which made all stop and take note. From this chaos a new awareness developed into an intense study and interpretation of the entire social structure of the country. It was unfortunate, but schools were not able to meet the challenge; thus, there was very little change in education. The only real change was that there was a little more emphasis put on special or vocational education.

In music we saw the influence of George Gershwin and his Porgy and Bess, as well as the beginning of Walt Disney's works, both of which were interpretations of problems of the times.

Literature reflected this through Henry Miller's Tropic of Cancer, James Farrell's Studs Lonigan, and Erskine Caldwell's God's Little Acre. All of these reflected the times and the hardships they brought. There can also be found subtle signs of a desire to return to the "good old days."

The 1940's brought another war and some spectacular advancements in production methods. Automation was introduced and mechanization was on its way out. Jet planes were coming in—propellers were on their way out. A new awareness again gripped the nation. Going to college was no longer a luxury befitting only the rich. It was becoming a necessity if one was to "get ahead." The effects of technology were truly making themselves felt in a big way.

The theater was expanding with more elaborate productions due to better lighting, more modern props, and drama schools which more could attend. The seriousness of war was over. A lighter mood prevailed. This was evident in such works as Rogers and Hammerstein's productions of Oklahoma and South Pacific. Both of these productions were light in mood. However, they were loaded with implications that were a direct result of our expansion of technology and its effects on humanity.

The message in literature was similar, as can be observed from Thornton Wilder's By the Skin of Our Teeth and Richard Wright's Native Son.

The 1950's produced another conflict of gigantic proportion. This, in turn, stimulated methods and a slight recession until 1959 and Sputnik. The pressure was on schools to produce. Science programs were evaluated and replaced with "new approaches" almost overnight. Math programs were replaced with the "new math." Educators were charged with providing quality education which prepared students for college. This was also supposed to better prepare them to take more responsible roles in society. The challenge was accepted, and students went to college in numbers as never before. However, after only ten short years, we find society unable to accept the results of a better-educated younger generation. This new generation is not satisfied or content with the answer, "because it has always been done this way." They are not satisfied with the status-quo or what is. They are more inclined to ask why. They are very concerned with what ought to be rather than what will be. This generation might possibly be classified as modern-day romantics because they are willing to stake everything on their beliefs and/or hypotheses.

What appears to be having a more devastating effect is that society is beginning to address itself to some of the issues that are being questioned by youths. The results are devastating, because society is finding that these challengers just might be a little bit right.

We see music again illustrating some of the moods of society. The protest was against violence in West Side Story. As a result of the existing violence, kids carried more knives to school so that the adult establishment would say, "No, you cannot do this." Eventually, we adults got the message. Americans began examining their values, as was reflected in J. D. Salinger's work, The Catcher in the Rye, and Ralph Ellison's The Invisible Man.

The 1960's brought unparalleled prosperity and change. Man landed on the moon.

He soon was able to communicate almost instantaneously around the world, not just with telegraph or telephone, but with television. He is now able to circle the planet Earth in a few hours.

Medicine has taken gigantic steps; we are now able to transplant veins, kidneys, hearts, cut off bones and turn them around. We are even able, in some circumstances, to completely replace with artificial replicas vital parts of the human anatomy. We can keep brains alive indefinitely. The list of accomplishments appears almost endless.

The musicals of the '60's are reflective of this fantastic rate of change. We see a revival of a longing for a bygone, simpler day with Oliver, Fiddler on the Roof, and Charlie Brown. Again in literature we find an awareness with Franny & Zooey by J. D. Salinger. John Dos Passos' Mid-Century was examining society and its values with a hint of religion.

The late 60's ushered in a new morality. Questions were being asked, such as, do we have the right to take lives not yet born? Do we have the right to let a sick person expire when we have the means to keep him breathing for literally an indefinite period of time? Do we have the right to tell others what they can or cannot do with their bodies or how they dress?

Youth's reaction to these questions was Hair, and to really make us sit up and take notice, Jesus Christ Super Star and Godspell.

We are now able to fly airplanes 231 feet in length coast to coast. We are able to fly to the moon and beyond and dream of interplanetary space travel. We must prepare students to face the increasing amount of symbolism that is being generated by our rapidly changing world. Society is beginning to debate the issue of ecology. Are we going to be able to meet the challenge and do something about these problems? The "establishment" is acknowledging the problem. Youth is very concerned about it. As yet, neither group is really taking it to task. The establishment is more concerned about the price tag of a newer version of the Model-T and whether or not it should carry its own garbage to the street for pick-up. Youth is seemingly more inclined to use the idea as a rallying point than as a problem that they want to seriously pursue and eliminate. In short, society is more concerned with now and what is than with what ought to be.

Let us now turn to the adolescent and his widely-varied facets. How does he arrive? Where and how does he formulate his attitudes, views, and/or values? This is the development stage of a child's life style. The adolescent is developing his fundamental life urges, moral conscience, and self—otherwise identified as id, super-ego, and the ego (7, p.25).

The middle school student is an adolescent plagued with many difficult problems. He is faced with the many confounding physical changes which automatically come with adolescence. His growth rate is extremely rapid, and it may come earlier or later than his peers. He is physically awkward as a result of the sudden growth. He usually does not have the necessary advanced motor skills needed for handling small objects skillfully. There is a tremendous need for physical activity to eliminate pent-up emotions and to develop self-confidence in doing types of activities.

The middle school student is undergoing many processes, not the least of which is finding meaning and direction in life. He wants to assert his individuality, yet conform. He longs to be independent, yet protected. He also has a tremendous drive to venture into the new and unknown. He generally dislikes school, but enjoys learning.

The adolescent is deeply concerned with many aspects of himself such as self-perception, attitudes that are concerned with pride or shame, inferiority, self-esteem, or self-reproach. He is deeply concerned with his ideal self and how others assess him. All adolescents have one desire in common—that is, to be liked.

Peer relationships existing between two adolescents resulting in a close relationship are very complex and usually not well understood by teachers. When two adolescents are able to share one another's company as equals, they are able to feel free and share their innermost thoughts and feelings with each other. In a relationship such as this, there is trust between both parties. The relationship is effortless. Through a relationship such as this, an adolescent often discovers himself.

The middle school years are very important to the adolescent, since this is the time when he establishes his value standards. In other words, how does he compare with others? How do others perceive him? Does he meet or conform to the acceptable peer group standards and mores?

With the preceding in mind, it is also important to note that the concept of self is formed through identification, role playing, and the various life experiences that one vicariously encounters. These are the bases for eventual determination of vocational choices.

It is hoped that the preceding has provided the opportunity for one to put into perspective the factors which should influence the design of a contemporary program in technology, a program which will not only educate students with what is but what will be or may be encountered in their future life experiences.

We can no longer be interested in dwelling on past experiences, but in preparing youth for the future and what ought to be.

Let us turn now to the design of a contemporary program which studies technology with the foregoing in mind. The major area is production. It must be student-oriented and teacher-directed, not teacher-oriented. The student must be placed at the center of the curriculum and be considered as the product, using the processes of production as the method of education. The content must be composed of those life experiences which can be found in the contemporary American and world society.

The program that I advocate provides many opportunities for students to explore problems together as a class, individually, and/or in small groups (refer to Figure 1). They thus learn the interaction of working with others productively and yet remain an individual.

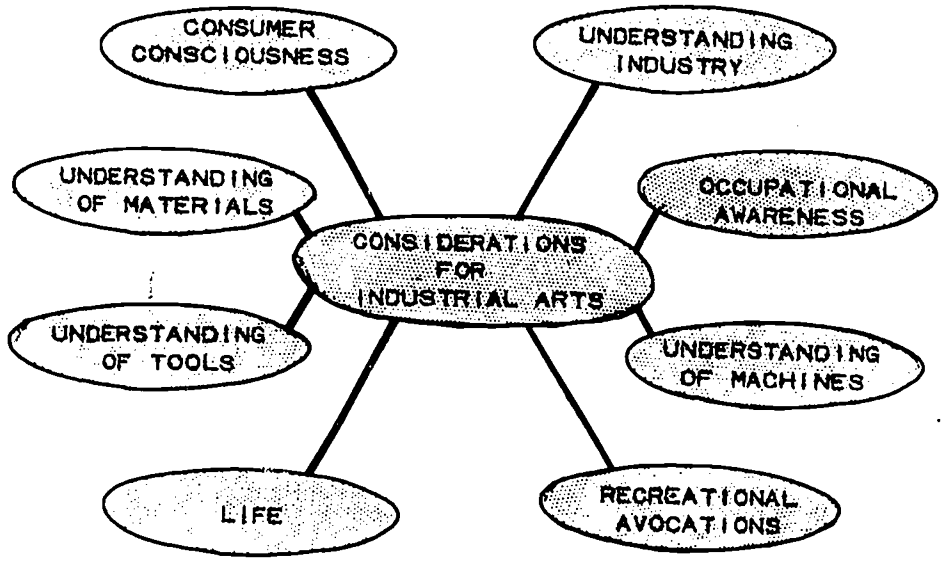

FIGURE 1

The student is able to evaluate his own work habits as compared to his peers. He is also able to learn through those vicarious experiences which unexpectedly arise from time to time. The student must be able to encounter situations which are indicative of real lifelike roles.

A program should provide maximum psychomotor activities for the student to develop motor skills and realize personal limitations. The program should also challenge the student's cognitive faculties and provide a harmonious balance of success and/or failures. A student must have the opportunity to occasionally venture into the unknown. The instructor must realize that there is more to education than just passing or failing. It is of vital importance that the adolescent understand this concept also. In other words, there is more to life than just winning or losing.

From the preceding overview of issues, I feel that a rationale for a program of technology of general education should be centered around production activities which best represent the four basic components of American education which Wingo has described as being "Nationalism, Capitalism, Democracy, and Science" (14, p. 35).

Many programs are reflective of only motor-type activities. There are some which have been designed to appeal to the intuitive and cognitive processes of the mind, as well as motor activities. These are definitely in the minority.

A program must offer the most flexible structure possible if it is to truly represent technology in a contemporary world. The program must lend itself to the understanding of American and world technology.

A program of production technology in the curriculum of general education should significantly relate to all other aspects of the curriculum. A relevant program should provide immediate knowledge and understanding of its significance to the learner (refer to Figure 2). This is only reasonable if indeed technology is to be considered a part of

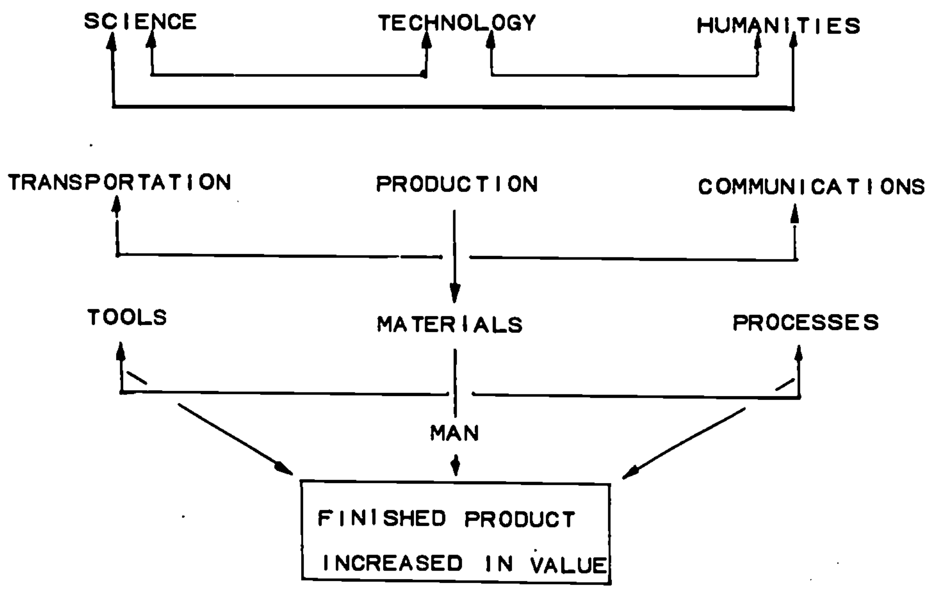

FIGURE 2.

general education. All too often, technology-oriented programs want to be recognized by general education but do not want to be a part of general education. Americans do not work English, history, science, mathematics, foreign language, or technology; they do, however, make use of all in their life experiences. Americans' lives are so diversified that we could not choose one specific area of specialization which will prepare students for entry into the future other than a curriculum structured around the concept of production. Such a curriculum must be identifiable with general education (refer to Figure 3).

The production segment of American technology was chosen because it is best able to organize the tremendous diversification of our technologies and intellectual disciplines together into a specific, logical, rational unit of study. This approach lends itself to the democratic ideal which our society has adopted. The economic theory of capitalism is easily structured to this concept. Using the combined knowledge of the humanities, science, and technology, a student has the opportunity to participate in many experiences that can only be found in a general education approach. The student is provided the opportunity to realistically examine those experiences that he has heretofore only had the opportunity to contemplate because "it was good for him."

In this program, the student will participate in an actual corporate organization that he had a part in organizing from the conception of the idea to the final production of a product. A product is manufactured on a student-designed production line under student management, yet teacher direction (refer to Figure 4).

To advocate this, one must adhere to the fact that the mind is prior. Each student must be provided with the opportunity to use his ability to reason at his own level.

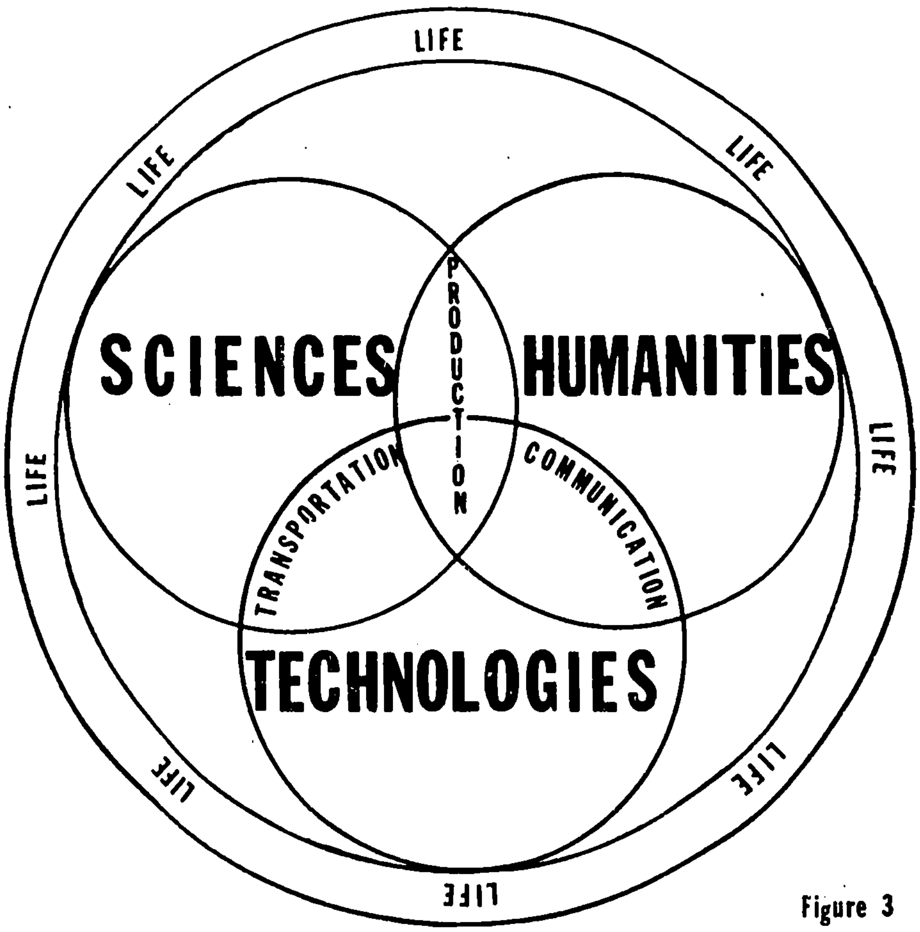

Figure 3

One must not be too concerned with the resulting physical product. While this is important to the student, the real product is the results of the cognitive and affective processes that have taken place in the mind of the individual.

After an experience in this method of study, an individual will be better prepared to work with the individual differences of his peers and yet perform as an individual. A student will be able to transfer knowledge from different types of experiences to completely different situations, acquire a degree of occupational understanding for a variety of occupations, and have an idea of the responsibilities of the various roles involved in life. This is an experience in which a student attains a degree of self-realization about himself and the culture to which he belongs.

The following is a broad general outline of the basic structure of the program recommended (refer to Figures 5 & 6).

I. TECHNOLOGY ORIENTATION
   A. What is it?
   B. Why study it?
   C. How can we learn the most from it?

II. PRODUCTION METHODS
   A. Quantity Production
   B. Quality Production

III. MASS PRODUCTION
   A. Definition
   B. Applications
   C. Historical Background

IV. SAFETY
   A. Discussion of Issues
   B. Evaluation of Laboratory

STRUCTURE OF A PRODUCTION SYSTEM

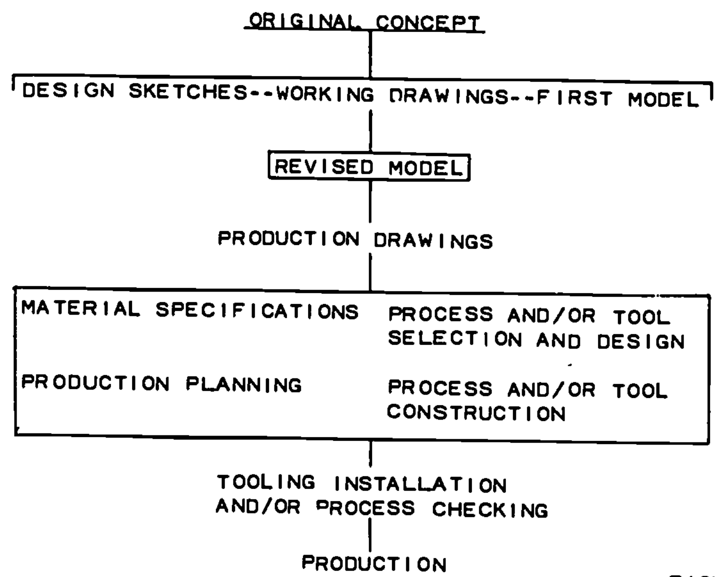

FIGURE 4.

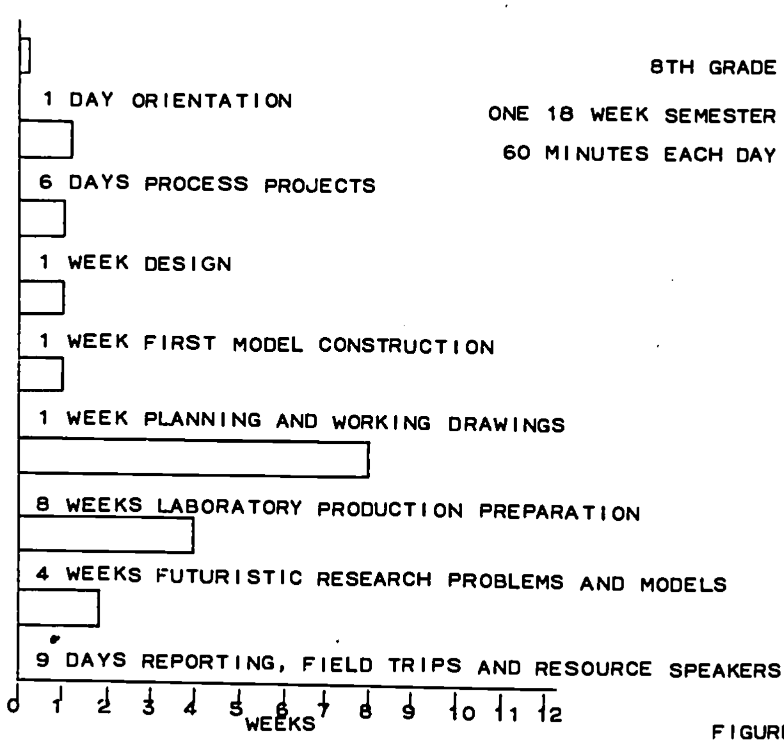

FIGURE 5

C. Personnel Evaluation
D. Program

V. DESIGN
   A. Discussion of what is good design
   B. Design and Materials
   C. Design and Color
   D. Design and Limitations

VI. IDEATION
   A. Discussion of what is a good product
   B. Brainstorm
   C. Presentations
   D. Evaluation

VII. PRODUCT SELECTION
   A. Discussion of why this one
   B. Evaluation of selection

VIII. LIMITATIONS
   A. Discussion of limiting factors
   B. Examine alternatives

IX. PRELIMINARY MODELS
   A. Building preliminary in small groups with time limit
   B. Discussion of problems
   C. Establish a tangible reference

X. MATERIAL SELECTION
   A. Discussion of type of material
   B. Selection of material

XI. MATERIAL COSTS
   A. Calculating material costs
   B. Preliminary purchasing procedures

XII. COMPANY ORGANIZATION
   A. Discussion of various types
   B. Corporate Financing

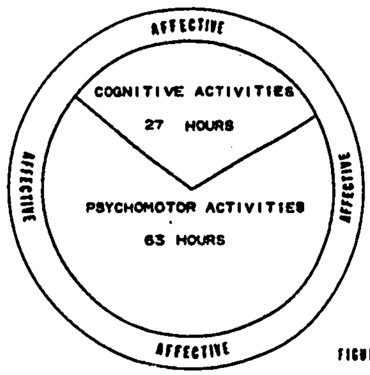

FIGURE 6

XIII. PERSONNEL STRUCTURE
   A. Positions of management structure
   B. Organizing positions in a company
   C. Student Roles

XIV. MACHINE PROCESSES
   A. Machine Introduction
   B. Student Participation

XV. MANIPULATIVE PROCESSES
   A. Student introduction to specialty processes
   B. Student Involvement

XVI. PRODUCTION FUNCTIONS
   A. Production
   B. Research and Development
   C. Marketing
   D. Finance and Control
   E. Personnel and Administration
   F. Communications
   G. Control

SUMMARY

Education has been expanded to the world community through a sophisticated communications network. Mankind has come a long way from the Model-T and Kitty Hawk to observing the planet Mars close up in 1972. There is no comparison between the player piano and the quadraphonic sound systems of today. We are discussing in public issues which thirty, twenty, and even ten years ago were considered to be unfit or improper for serious educated consideration.

While there have been many good things in our history, we must not let our heritage prohibit our progress to more relevant methods of education for all students.

We must be more interested in process rather than projects, more concerned with method than content. Our programs must be more future-oriented than reflective of the past. Last but not least, the student, no matter what age, must be considered as the product, with the blueprints for his education carefully drawn to prepare him for the future.

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Innovation Begins at Home

Daniel L. Householder

The classroom teacher operates at the focal point of educational innovation. The teacher may either accelerate or retard change; he may create his own unique industrial arts program. New approaches arise frequently in the local schools, but few practitioners have an opportunity to learn much about their colleagues' activities. Since so many improvements are made quietly at the local level, many of the most exciting innovations in industrial arts have not yet received widespread recognition.

Two major categories of program innovation dominate local curriculum improvement efforts at the present. Probably the most widespread is the methodological variation which organizes a class as a corporation. One or more products are manufactured, frequently for sale in the school or community. Indeed, this approach has become so common that it hardly seems newsworthy, yet its adoption in many settings would still be highly innovative. Details for the operation of a manufacturing activity in the classroom setting are readily available. Still, the implementation of the manufacturing approach in the industrial arts classroom is dependent upon the effectiveness and adaptability of the industrial arts teacher. Almost endless variations are possible with the basic manufacturing theme; most of them are in successful operation in at least one community.

A second major area of local innovation is in the broad area of career/occupational/vocational education. Industrial arts has long espoused goals and endorsed activities related to occupational competence. Many classroom activities in traditional programs do indeed have some occupational values. However, there has been a significant increase in the number of locally-developed innovative programs with career-oriented objectives. Specific organizational patterns vary widely. Some programs emphasize long-term, career-centered activities; others feature exploration followed by more intensive, yet generalized preparatory work.

There is no generally-accepted, nationally-disseminated "model" for either of these innovations. Rather, they have been "grass-roots" developments which have grown through the years. The fact that they are so generally recognized and readily accepted is evidence of the power of local innovation working in areas of recognized need.

On the other hand, a high percentage of recent curriculum change in industrial arts is attributable to curriculum developments of national and international note. Curriculum workers, teacher educators, specialists in other disciplines, and classroom industrial arts teachers have cooperated to provide leadership in many aspects of program improvement. However, even these efforts cannot be fruitful without the enthusiastic cooperation and support of the teachers, supervisors, and administrators in the local schools.

Curriculum improvement requires a willingness to change, to accept new ideas, to cast aside time-worn beliefs, habits, and patterns of teaching. The industrial arts teacher is many things: innovator; stimulator; creator; doer. He stands at the "gate" in the literal as well as the figurative sense. Only those procedures, strategies, purposes, activities, and concepts which he permits in the classroom have an opportunity to blossom in the school. Thus, even major curriculum projects have a chance for success only as they identify and recruit classroom teachers who are sympathetic to the "cause" and capable of implementing the innovations effectively.

Furthermore, most teachers exert their professional prerogatives in accepting curriculum change. Few are willing to accept a program developed outside their milieu without including at least a few of their own adaptations to adjust the standard approach to their own unique setting. Even the most highly structured programs are significantly altered in their applications by teachers across the country.

In a very real sense, when one examines the nature of educational change, he can only conclude that the classroom teacher plays the critical role in all of education. Curriculum improvement is only possible when he is in control, encouraging innovation and stimulating necessary change.

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Materials and Processes: A Conceptual Course in Industrial Arts

Donald E. Moon

Schools reflect the society they serve. The rapid advances of industrial technology have had and will continue to have an overwhelming influence on education and society. A technological culture has been created with the development of practical applications, science principles, artistic and applied design principles, and techniques of production. Industrial arts is that part of the educational program which concerns itself largely with preparing individuals to live in a technological culture. This is supposedly achieved through a study of industry by providing first-hand manufacturing and service-type experiences in the use of tools, materials, and processes. I contend that industrial arts as a whole does not achieve this goal under the present structure of industrial arts courses. To fulfill this goal, industrial arts courses must be reorganized with an emphasis on the concepts common to all industries.

Materials and processes is a conceptual area or study that more nearly typifies modern technology than courses now being offered.

Industrial arts has and should continue to derive its subject matter from industry. Industrial arts programs operate in laboratories or shops equipped with the basic industrial materials, machines, and energies of industrial technology. A modern and up-to-date industrial arts program must have laboratory facilities that not only provide a technological environment representative of modern industry but be truly reflective of modern technology. Provisions must be made for the industrial arts program and supporting facilities to be flexible enough to accommodate the constantly changing industrial technology.

A review of literature reveals that much concern has been expressed by educators as to what the industrial arts programs in a modern high school are and should be like in the future.

Dr. James E. Russell, in 1909, made the following statement when discussing the emphasis placed on manual training. "In fact, manual training today is little more than applied design." If I may paraphrase Dr. Russell's statement: "In fact, industrial arts today is little more than applied design." When discussing what ought to be taught, Dr. Russell said: "The study of industries (should be) for the sake of a better perspective of man's achievements in controlling the production, distribution, and consumption of the things which constitute his material wealth" (7, p. 6). In 1963, Delmar Olson wrote, "We know that woodworking is typical of today's industrial arts, that hand-tool processing is the accepted pattern. With wood, then, as the material and hand-tools, muscle-powered for the processing, today's industrial arts fits technologically into the Crafts Age. Such a placing may not be altogether proper, but it may be more so than we care to admit" (5, pp. 88-9). John L. Feirer gave emphasis to the problem when he wrote, "Some idea of what is happening to our industrial education programs at the senior high school level can be gained by studying present-day building reports, which show the school facilities to be built in the next two or three years. In studying these building reports, we find that most high schools are planning for three areas—drafting, metals, and wood. These are the only three being provided for in many new high schools. Only a few new high schools will have space and equipment for electricity-electronics; even fewer will have such areas as power mechanics, graphic arts, and industrial crafts. The high schools being planned today will not be equipped to offer a complete program of industrial education" (3, p. 31). Marshall L. Schmitt, Specialist for Industrial Arts in the U.S. Department of Health, Education, and Welfare, reported in 1966 that, "... there are over 202,000 classes in industrial arts education in the public secondary schools. However, only four industrial arts courses have a large number of classes: General industrial arts, 56,050 classes or 27.6%; general woods, 44,238 classes or 21.8%; drafting, 39,573 classes or 19.4%; and general metals, 28,911 classes or 14.2%. Very few classes are reported in graphic arts, power mechanics, and electricity/electronics, even though these courses are designed to develop an understanding of man's technological achievements in communications and transportation—two of our country's major industrial groups" (6, p. 22). These statements would support my contention that industrial arts programs, for the most part, are not reflective of modern industrial concepts. They are as materials-oriented today as they were in 1909 when Dean Russell first made his comments on the status of manual training.

American technology, through advances in automation, is marked by constant change. With the subject matter for industrial arts being derived from industry, this subject matter is in a state of continual change. Industrial arts programs and supporting facilities should be so flexible that they can easily adapt to the changes. Subject matter and facilities accepted as proper and adequate for industrial arts at the turn of the century are now outmoded. Olson (5) refers to a "technological lag in industrial arts" as being evidenced by today's typical industrial arts programs which have been built largely around materials processing.

Interpreting American industry involves selecting those elements of technology which are keys to change and growth. Analysis of industry, in the form of process operations, is necessary to ascertain those components which determine the degree to which industrial arts can be more representative of American technology.

The materials of wood, metal, plastic, leather, paper, etc., are not treated by industry as entities unto themselves, but as industrial materials. They seek to develop the materials with the right combination of properties to meet their service and economic requirements. Generally speaking, they are unconcerned whether the chosen materials are wood, plastic, or metal. This would suggest that all of the industrial materials can be integrated into a course with a conceptual framework, oriented to the commonality of the principal process operations performed with the industrial materials. Mr. H. R. Clauser, publisher and editor of Materials Engineering, wrote, "Like so many important advances in technology, the source of our modern materials concepts can be traced back to basic science. Thus, over the last two decades or so, the probing of the solid state scientists into the nature of matter has led to the seemingly self-evident finding that the properties or performance of every kind of engineering material depends upon its internal structure or 'architecture.'" And also, "... according to the structural concept, what marks one material from another is not the stuff of which it is made, but rather the difference in form or pattern, in organization, and in interaction of the basic units (whatever those units may be)" (1, p. 38). Therefore, in industrial arts education, we must not look upon a material as the substance of our courses. We must look at all materials of industry as content, with emphasis upon the choosing of the right material to solve the technological problem at hand.

I would like to use an illustration that Mr. Clauser (1) uses in his article pertaining to modern materials concepts. He takes the reader through an imaginary example in order to compare the traditional design approach to the modern method of designing a composite. For our example, we will use a fluid container or tank. In the traditional approach, we would select a material to meet mechanical requirements, then add cooling or heating pipes to the interior of the wall by means of hangers or fasteners. The corrosion problem inside and outside would probably be solved by applying a coating or coatings. It is quite likely that each of these service requirements would be considered separately and, also, that the choice of materials would be based largely on past experience.

If we used the material design approach, outlined by Mr. Clauser (1) previously, we would not attack the problems piecemeal, but, rather, would direct our thinking towards finding or developing a materials system that would fulfill the multiple requirement of the application. Thus, the material sought would provide the combined functions of enclosing the liquid, resisting corrosion, and maintaining the desired liquid temperature. At the present state of materials technology, the solution would probably involve the development of a laminar gradient composite.

The pleasure boat industry has not only replaced wood with reinforced plastic laminates, but structural components traditionally made of wood. Polyurethanes of varying densities are now used. They not only meet the structural requirements of the component, but have decreased its weight, increased its buoyancy, and eliminated the age-old problem of wood deterioration through rot and insects.

The combination chess-checker-coffee table that was displayed in a state convention recently was definitely not an example of the application of the systems approach in choosing appropriate materials for the design problem. Not only did it violate principles of good design with its heavy (5 inches in diameter) ornately turned column and spread legs, but the material chosen for these components was Tennessee red cedar, a material well known for its structural weaknesses. The playing surface was laid out in walnut and Tennessee red cedar and finished with linseed oil. It would not only be difficult for the players to know if they were playing their pieces in their proper patterns because of the lack of contrast in the pattern, but the finish employed would continue to bleed on the clothing of the players.

What I have been presenting are examples of modern systems theory. The systems approach involves looking at the whole as an assembly of interrelated parts that produces a given output for a given input. According to the systems concept, a composite is a material system consisting of two or more interacting constituents designed to provide the desired performance when subjected to a given set of service conditions.

I would now like to extend the systems idea to include the processes used to convert and shape materials into end-products. From a systems viewpoint, therefore, the end-products can also be thought of as material-process systems.

Mr. Clauser (1), whom I referred to earlier in this presentation, wrote the following in reference to the material-process systems. "The practicality and usefulness of the material-process system approach is demonstrated in the establishment, organization, and operation of materials engineering departments. (Reference being made to a rather recently-accepted concept in industry.) Their function encompasses not only the selection or development of materials to meet given service requirements, but also the selection or development of the materials processing and fabricating methods.

"At one large aircraft company, a new laboratory has been planned that physically epitomizes the material-process system concept. Its organization, layout, and facilities represent all phases of the evolution of a material-process system from idea to production. The result is an integrated effort in which the selection or the development of materials and the development of forming, processing, and testing methods proceed at one and the same time."

This example from industry would suggest that industrial arts courses and their facilities can and should be organized with the material-process system in mind.

In the Industrial Education Review, a publication of Stout State University, an article appeared which discussed the unification of materials in curricular planning. In part, the article stated, "The principal reason for the increased attention to all industrial materials is that there is a strong movement in the direction of a unified materials field and discipline. The traditional boundaries between different families of materials are being swept away. Using the systems approach, the manufacturing industries now consider all materials for their products. They seek or develop the materials with the right combination of properties to meet their service and economic requirements, and they are unconcerned whether the chosen material is metal, plastic, or green cheese. Today's workers, technicians, and engineers should be familiar with the properties and fabrication of all the many materials now available to industry" (2, p. 5).

A recent study (4) of manufacturing industries, selected from the industrial classifications as listed by the U.S. Bureau of the Budget in its Standard Industrial Classification Manual, established that all the principal process operations performed by the manufacturing industries could be grouped into five conceptual areas. The study made no attempt to associate the industries with any particular industrial material. These conceptual areas are forming, casting and molding, shaping by cutting, assembly, and auxiliary.

The study (4) further identifies the principal process operations of the manufacturing industries that should be considered as curricular components in each concept area. In addition, it determined elements of commonality that existed between the industrial classifications in the performance of the process operations.

The conceptual area of FORMING contained 43 principal process operations, all of which were performed by the manufacturing industries studied. In addition, some degree of commonality does exist in the methods employed to perform the process operation. Examples of process operations are cold bending, hot bending, forging, punching, rolling, flanging, die pressing, piercing, and blanking.

The conceptual area of CASTING and MOLDING listed 23 principal process operations. Examples of these operations are sand casting, permanent mold casting, shell mold casting, plastic molding, injection molding, and contact layup.

The SHAPING by CUTTING concept was the most active, in terms of the process operations listed and being performed by the manufacturing industries. The only operation that was performed by hand methods, to any great extent, was filing. All 29 operations listed under this concept were performed by machine methods. Turning, drilling, counter boring, countersinking, sawing, milling, shaping, planing, sanding, and threading are examples of the process operations listed under this concept area.

Twenty-three operations were listed in the concept area of ASSEMBLY. Two categories of assembly operations were established, permanent joining and mechanical assembly. Examples in the permanent joining category were such operations as oxygen-acetylene welding, soft and hard soldering, and brazing. These were also among those most often performed by machine methods. In the mechanical assembly category, such operations as riveting, fastening with screws (self-tapping), machine screws, wood screws, and nails were very much in evidence. A large percentage of the manufacturers surveyed indicated that they did many of the operations using machines, some of which were automated.

The AUXILIARY concept included those processes operations which were not directly related to the basic construction of the product, but were necessary to the completion of the product. This concept area included such process operations as welding, straightening, washing, degreasing, deburring, stress relieving, tempering, normalizing, and painting.

Although we live in an age when automation seems to be replacing men and women in the factory, a great number of the process operations are still being performed by hand methods. This appears to be more true in the concept areas of assembly and auxiliary. Although automated machines were predominantly used in the forming and shaping by cutting areas, they were reported as being used in all of the other areas as well. This information would be important when identifying the method of performing the operation in the laboratory.

This study proves without a doubt that there is an organized body of knowledge to be found in industry to assist in the development of the materials and processes area of study. The conceptual areas identified in this study can not only form the foundation for the development of the curriculum for a course in materials and processes, but give direction to the planning of industrial arts facilities needed to implement the curriculum.

The process operations mentioned in the various concept areas are only a few of those that are regularly performed by manufacturing industries. An analysis of the accumulated data, reported in the study, indicated those process operations that should be included as curricular components of the MATERIALS and PROCESSES area.

The individual who studies and experiences a variety of process operations performed in much the same manner as in industry, along with the application of the underlying fundamentals of the concept, should be able to apply the concept and choose the correct process operation and appropriate equipment to perform the task on the industrial material with which he must work.

The structuring of a course titled "MATERIALS & PROCESSES" is a logical approach to the conceptual study of the principal process operations and the industrial materials in the manner in which industry utilizes them to satisfy their needs. Such a course could replace the traditional materials-oriented industrial arts courses. It is also possible that such a course could serve to reinforce and enhance the materials-oriented courses in the curriculum. In either case, it would provide an opportunity for students to study the concepts of materials and processes, as applied to the solution of industrial problems.

Thus far, I have been presenting a case for materials and processes as a curricular area in industrial arts. The support for the curriculum has been developed from a study of industry and the research. In addition to this support are the many innovative programs and curricular organizations that advocate such a reorganization, programs like The American Industry Program, the Industriology Project, the Galaxy Plan, and the more recent Function-Concept Based Program of Oregon State University; all advocate a realignment of the curriculum to better reflect technology.

Concept teaching has been mentioned from time to time during this discussion. I would be amiss if I did not take time to emphasize its importance to the success of the materials and process curriculum.

Concept teaching is not a new educational gimmick. It has been used by educators for many years, some more successfully than others. All of us have done concept teaching to a greater or lesser degree. However, the proper utilization of concept teaching, as a method of presentation, can aid us in teaching certain technological concepts to students at any level of their schooling. Many basic concepts of industry that we hold back from the students at the elementary or junior high level can be brought into the curriculum earlier through concept teaching. We have deferred the teaching of certain concepts to later years because we think of them as too difficult for beginners. Evidence from other areas of education seems to indicate that the problem is not so much whether the concepts can be taught as how they can be phrased in terms appropriate to the development of the student and separated from the extremely technical details of their applications to complex situations.

I would like to repeat an illustration that Dr. Robert Swanson used in a presentation in Iowa several years ago. To illustrate the concept teaching idea, he chose the concept of precision. He says,

> If there is any one complaint teachers seem to have generally, it is that students cannot read a rule. We often think of precision in terms of fitness of measure. A precise measurement is expressed in fine graduations. A measurement expressed in thousandths is more accurate than one expressed in eighths. As they proceed through the advanced levels of shopwork, students learn to use instruments of greater and greater accuracy and to read finer and finer graduations. In terms of the accuracy of work that a student is able to do, perhaps it is all right to have him read to a quarter of an inch in the seventh grade and a thousandth in the twelfth grade. Of course, an understanding of the basis for the fractional division of a unit renders it just as easy to read eights as quarters.
>
> But I would ask, "Is the concept of precision tied solely or even largely to accuracy of measurement?" One reason that we do tend to emphasize this view of precision is because it is a practical necessity for the manner in which we provide activity. If we are to teach accurate work habits, we must provide a means of measuring the accuracy of the work.
>
> What are other, broader, aspects of the concept of precision? Another facet to the concept of precision is the principle of variation in mass production and the interpretation of the meaning of error. In the custom fabrication of a product, error is interpreted to mean a mistake by the craftsman. We are all well aware that in mass production, even with an automatic machine, using the same set-up, the same materials, and seemingly the same conditions, there will be variation in the product—error. But this is an entirely different concept of error; it is random error, not a mistake. The concept of precision as a specification of the percentage of products that will fall within given tolerance limits is an important interpretation of precision in industry (8, pp. 5,6).

We can teach this and other important aspects of industry in our study of industrial arts through a variety of methods. I do not believe that there is any one method that will be more satisfactory than another in concept teaching. Because of the variety of styles of teaching, each appropriate to the individual industrial arts teacher, concept teaching will be as effective as the instructor wishes it to be. Ingenuity of the industrial arts teacher is well known, and I am sure that if he sets his mind to it he will become an efficient and effective concept teacher.

Industrial arts students live in a dynamic, ever-changing industrial-technological society. Preparation for their place, now and in the future, in this society places multitudinous demands upon us as industrial arts teachers. The numerous changes occurring in industrial technology alone are placing heavy demands on industrial arts teachers, if they make any kind of an attempt to keep abreast of them. It is simply not enough to train students to live in a constantly changing world; it is also necessary to transmit to the student a sense of values and the worth of participation in the technological process which is such a vital part of our society. Industrial arts, through a materials and processes curriculum, can provide opportunities for individual fulfillment, individual achievement, and individual freedom.

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Industrial Arts Curriculum Project—Past, Present, and Future

James J. Buffer, Jr.

From June 1965 to August 1971, the initials IACP identified the Industrial Arts Curriculum Project, a curriculum development effort headquartered at The Ohio State University. The IACP evolved from the need to provide more relevant educational experiences regarding the technological practices used by man to provide for his material needs and desires. The project was headquartered at The Ohio State University, funded by the USOE, and administered by the OSU Research Foundation. Staff from the University of Illinois and numerous public school systems assisted with the research, development, evaluation, and dissemination of the instructional system. Representatives from business, industry, and substantive specialists from the academic community also provided professional and financial assistance.

Today, now that the funded project has been officially terminated for several months, we have found that the IACP label has remained at OSU and is now prevalent in over 1/3 of the colleges and universities which prepare industrial arts teachers. Of more importance, however, is that IACP has become known and accepted by educators, students, parents, and industrialists as an innovative instructional system which provides broad concepts and principles of contemporary industrial technology and is viewed as a viable program to help today's youth better understand their man-made world.

My presentation today was not prepared to provide information which would be needed by school personnel to install the IACP instructional system. Rather, it is my understanding that this Special Interest Session was initiated to give spokesmen for two curriculum projects in our field (American Industry Project and the IACP) an opportunity to share with the profession a status report of project activities. To help us accomplish this task, our program chairman has suggested that our reports deal with the three time dimensions of "Past, Present, and Future."

PAST

Past accomplishments of the IACP are a matter of historical record. Numerous articles have appeared in the professional literature of education and industry describing the IACP. Of particular interest to the educator who is seeking a review of the developmental efforts and outcomes of the project might be three documents produced by the IACP staff: (1) The November-December 1969 issue of The Journal of Industrial Arts Education; (2) The Rationale and Structure for Industrial Arts Subject Matter (1966); and (3) the IACP Final Evaluation Report (1971). The latter two are available through ERIC Document Reproduction System. Additional descriptive information plus the instructional materials may be obtained from McKnight and McKnight Publishing Company, the USOE-assigned publisher of the IACP Instructional System.

The Purpose of the IACP

The general purpose of the Industrial Arts Curriculum Project was to effect curriculum change in industrial arts education. To accomplish this, six tasks were undertaken by the project staff. This section will list the major objectives and briefly review the evidence that supports their successful completion.

Objective No. 1: Conceptualization of a Structure of Knowledge in the Field of Industrial Arts. A comprehensive analysis of the literature and preparation of an annotated bibliography served as the initial step. This was followed by the development of a set of criteria for determining a structure. Criteria dealing with scope, limitations, and sequence were initiated, and a working paper on the structure of content was drafted. Consultants from various academic disciplines together with those from industrial management, labor, and business assisted in these tasks.

The formulation of Task Force working groups was the next input. Members of these groups were drawn from selected substantive areas of industry. These groups met and further identified the concepts and principles within the structure.

The project staff next prepared a revised manuscript and submitted it to approximately 100 leaders in education for their reactions. Their input was utilized to prepare the final copy of the rationale for the IACP.

The major outcome of this objective was the 382-page volume entitled A Rationale and Structure of Industrial Arts Subject Matter (Towers, Lux, and Ray, 1966). The document stands as the only comprehensive undertaking of this kind in the field of industrial arts education.

Objective No. 2: Development of a Syllabus for Industrial Arts. In order to complete this objective, it was first necessary to identify the criteria to be used in developing the syllabus. Guidelines focused on six factors: the structure of the body of knowledge, desired behavioral changes, nature of the learner, school facilities and materials, instructional procedures and materials, and measurement and evaluation.

Under these criteria, a conference group was organized to develop general objectives of the program. The criteria and objectives served as a referent for structuring the teaching-learning components for a two-year curriculum sequence. As sections of the program were completed, over an 18-month period, they were submitted to the National Advisory Committee and modified.

The next step consisted of a series of conferences which resulted in a detailed outline of the reading assignments. Throughout this process, numerous consultants were used from the substantive areas of construction, manufacturing, and educational methodology.

The successful achievement of this objective served as the basis for the following objective.

Objective No. 3: Production of a Package of Teaching Materials. The initial effort toward the achievement of this objective was a preliminary pilot study. "Interchangeability of Parts" was the concept selected. Based on this concept, curriculum materials and an instructional system package were invented, field tested, and evaluated. From this, insight was gained into the problems and procedures for generating instructional materials and managing activities in test centers. Estimates were made as to costs, time requirements, personnel requirements, materials, and procedures.

Based on this information, a PERT analysis was developed for the period from December 1966 through August 1971. A major thrust of this time period was the development of an instructional system.

Utilizing the knowledge base established through the development of the rationale and structure of industrial technology, The World of Construction was invented, designed, constructed, and assembled in the period from January 1967 through November 1967. Also, the initial development of The World of Manufacturing was begun, and the first edition of the manufacturing instructional system was completed by November 1968.

These two instructional programs were the major input to the completion of the following objective.

Objective No. 4: Field Testing and Revision of Teaching Materials. Following the the initial development of the instructional system, a field-testing program, based on two questions, was planned and made operational:

1. What information is needed by the curriculum decision-makers in order to make intelligent decisions regarding program revisions?
2. How can the required information be obtained?

As a next step, a strategy was identified with which to evaluate the instructional system (textbook, laboratory manuals, teacher's guide, hardware, instructional format, teaching methods, laboratory activities, evaluation procedures, etc.).

1. Formative Evaluation. The quality control plan for the program elements during their initial development and subsequent revisions.
2. Summative Evaluation. The determination of whether the program elements provided a valid solution to the attainment of the educational specifications.
3. Intraschool Evaluation. The collection and analysis of data and procedures to aid educational decision-makers regarding the adequacy of the instructional program for local adoption.

A network of Field Evaluation Centers was next established across the United States for the field testing. For the 1968-69 school year, this network totaled six Field Evaluation Centers consisting of 24 schools, 48 teachers, and approximately 5,000 students.

The outcome of the three-year field testing and revision cycle, based on the rationale, syllabus, and program development, was an instructional system consisting of software and hardware entitled The World of Construction and The World of Manufacturing. These materials are currently available in a fourth edition (first commercial edition).

Objective No. 5: Dissemination and Field Promotion of Teaching Materials. To create a widespread awareness of the research and development progress efforts of the IACP, several lines of communication were used. Included were articles in periodicals, presentations for interested publics, conferences, brochures and pamphlets, newsletters, and personal correspondence.

In addition, Field Demonstration Centers were established to use and evaluate the IACP materials, in third edition, one year prior to commercial availability. These programs provided an opportunity to determine how schools adopt and adapt the IACP program to meet local educational and social needs, without the restrictions imposed upon the Field Evaluation Center programs. Also, demonstration programs provided additional prepublication dissemination concerning the IACP as well as external evaluation data.

The dissemination of the first commercially-available IACP product, The World of Construction software and hardware, was undertaken in December 1969 as a combined effort of the IACP staff and the McKnight and McKnight Publishing Company, upon the award of a limited five-year copyright contract. The copyright is held by the OSU Research Foundation, and all royalty earned through the sale of IACP software is returned to the USOE and Ohio State University Research Foundation for use in further curriculum development and teacher education, as approved by the U.S. Commissioner of Education. Since that date, about 160 additional school systems have adopted the program, increasing the enrollment in The World of Construction to approximately 45,000 students, in 540 laboratories in school systems in nearly every state (August 1971 data). The enrollment projected by the McKnight and McKnight Publishing Company in The World of Construction and The World of Manufacturing by the 1974-75 school year will be nearly a million boys and girls. This figure accounts for approximately one-third of the existing enrollment.

Objective No. 6: Development of Teacher Education Programs. An undergraduate program to prepare teachers of industrial technology was begun at The Ohio State University in the autumn of 1968. Some of the students in this program were supported by a scholarship program established by a national labor-management organization. A new undergraduate curriculum was designed to provide teachers with a background of knowledge in modern construction and manufacturing technology.

The McKnight and McKnight Publishing Company, in cooperation with IACP staff, established a geographic network of teacher education workshops in 16 educational institutions to prepare more than 500 construction teachers during the summer of 1970. This network of teacher education workshops experienced phenomenal growth during the 1971 summer school period, with 45 colleges and universities offering 72 workshops in construction and manufacturing. The 1971 workshop groups were functioning in industrial arts teacher education institutions in 28 states and in Canada, with an estimated 1,900 participants. The geographical spread of these institutions was from Florida State University in Tallahassee to the University of Alaska in Fairbanks, and from the University of New Brunswick, in Canada, to California State College at Long Beach. At the time this report was prepared, 78 colleges and universities were planning to conduct 127 workshops during the summer of 1972, in 41 states plus Canada and Washington, D.C.

The Products

By accomplishing the six major objectives, the IACP has been successful in effecting desirable curriculum change in industrial arts, a change from the fragmented and amorphous activities of conventional industrial arts to an articulated program of study based on a structured body of knowledge and on meaningful patterns of experience. As a result, students now have an opportunity to develop an understanding of their man-made world and to enjoy the benefits of their insights and knowledge in enlightened citizenship, educational-occupational guidance, and personal integration with their technological culture and the world of work.

The major accomplishment of the project was an instructional system based on a logically-derived rationale and body of knowledge that was field tested, revised, and disseminated to qualified industrial arts teachers for adoption, or adaptation, throughout the United States. The two-year sequence of The World of Construction and The World of Manufacturing and related professional programs, e.g., teacher preparation, were the result of this research, development, evaluation, and dissemination effort. Substantive elements of the program were principally authored and continuously reviewed by numerous practitioners from industry (including both labor and management) and education. In addition, all curriculum materials were developed and tested by over 40 IACP headquarters staff and 84 field staff in 53 schools in 25 cities in 13 states before the materials were made available commercially. Over 20,000 students covering a complete range of socio-economic and academic ability levels successfully completed the program during field testing. The entire program is thought to have the potential for improving the junior high school industrial arts curriculum by providing relevant and exciting learning experiences of the man-made world, much as science provides knowledge of the natural world.

The foregoing commentary is substantiated by documentation showing that all of the overarching goals were achieved. The reader is referred to the Final Evaluation Report (Buffer, Lux, and Ray, 1971) which summarizes the problems and accomplishments of the IACP from its inception on June 1, 1965, to the termination of the project on August 31, 1971.

PRESENT

Although the IACP is officially "ended," the project staff has found itself continuing to function in several kinds of activities related to the IACP. Dissemination and promotion have become our most time-consuming activities. Dissemination activities include the preparation of articles, speeches, planning and conducting teacher preparation workshops, and assisting secondary school personnel in adopting and installing the instructional program.

The staff at OSU has as one of its major responsibilities the planning and coordination of pre- and in-service teacher workshops for the summer session and regular school year. These activities have been conducted primarily through teacher education institutions, although the staff clearly appreciates the need and value of working cooperatively with school supervisors. As a result, we are in the initial stages of planning strategy for continued cooperative activities with supervisors and local educational agencies. A number of successful programs have already been conducted by supervisors and experienced IACP teachers in several school systems in California, Ohio, Texas, Nevada, and Florida, for example.

Former field staff who have completed 3-5 years of successful teaching experience in the IACP program are playing an active role in dissemination activities. Most have assisted with teacher preparation by team-teaching with industrial arts teacher educators in IACP workshops at colleges and universities. In addition, field staff continue to provide professional assistance to school systems in their immediate areas by serving as resource staff to those seeking information about the instructional system and assistance with program installation.

Of particular significance has been the continual and expanding support of industry and business to help nurture the growth and expansion of the IACP. One would have difficulty attempting to identify other educational programs which have had the benefit of such broad and extensive non-school support from the private business-industry sector of the community. Not only did major industrial societies such as the Associated General Contractors, the Society of Manufacturing Engineers, the American Society of Civil Engineers, and several international Unions of the AFL-CIO provide advisory assistance and substantial support during the development of the instructional system, but these and other groups are continuing to promote the adoption and installation of IACP in secondary and collegiate programs. This has been accomplished, in part, by sponsoring joint conferences between industrial and educational leaders to "inform" them of the rationale for the instructional system and its function and value. In addition, industrial groups have "adopted" individual schools, and in some cases complete educational systems, and are providing generous contribution of materials, supplies, and professional resources to serve as a catalyst to initiate new programs.

Industrial groups have also supported the preparation of industrial arts teachers for The World of Construction and The World of Manufacturing. In addition to a scholarship fund initiated at OSU by the International Brotherhood of Electrical Workers and National Electrical Contractors Association (IBEW-NECA) jointly to support the pre-service preparation of construction teachers, other groups are supporting the operation of teacher workshops in local school systems as well as in colleges and universities. Representative activities include: (1) the Detroit chapter of AGC provided the leadership for organizing and is sponsoring, in part, a Demonstration Center in the Pontiac (Michigan) public schools; (2) the Building Trades Employers' Association (BTEA) of Cleveland, Ohio, budgeted a five-year appropriation to sponsor teacher preparation workshops complete with stipends for industrial arts teachers, and also support the construction program in ten Cleveland area schools; (3) three Tennessee SME Chapters are cooperatively promoting the program in Central Tennessee; (4) the Florida West Coast chapter of AGC is assisting schools in Hillsborough, Polk, and Pinellas counties to adopt the program and is supporting teacher preparation; (5) the sponsoring of scholarships for 60 industrial arts teachers by AGC in Colorado to attend teacher workshops; (6) the sponsorship of a retraining workshop for industrial arts teachers in the Indianapolis public schools and the support of IACP programs by the SME Chapter of Indianapolis; and (7) the funding of a teacher workshop at Penn State University by the ASCE. These are only a few examples representative of the numerous activities underway by industrial groups to help promote the IACP and educational changes in our public schools.

Publisher

The IACP administrative staff took the position that widespread and successful adoption of the instructional materials could best be accomplished through the efforts of a major textbook publisher experienced in the publication and promotion of secondary school curriculum materials. The McKnight Publishing Company of Bloomington, Illinois, has already exceeded the expectations of the IACP Advisory Board and staff in achieving this goal. McKnight personnel have worked cooperatively with IACP headquarters and field staff to disseminate information and promote the instructional system through a series of conferences and orientation sessions with educational administrators, supervisors, and industrial arts teachers throughout the United States. Well over 150 of these meetings and conferences have been conducted to date to promote the program. In addition, McKnight has found it necessary to expand their advertising at different levels and exhibit at conventions for school administrators, curriculum personnel, and school board members at associations such as the ASCD, AASA, NASSP, and NSBA. It was recognized that the support of educational decision-makers and change agents must be achieved, in addition to that of industrial arts educators, if the schools would be able and willing to adopt and install the IACP instructional system.

McKnight has also prepared and printed numerous brochures and circulars describing the educational specifications of the IACP programs, and providing information needed by educators to determine installation costs, equipment needs, teacher-training opportunities, and other information necessary to make judgments regarding the appropriateness of the program for local adoption. Similar descriptive literature was prepared for industrial personnel who might be willing to help disseminate information and promote the IACP program.

The publisher and IACP staff have cooperatively planned and coordinated the establishment of teacher education workshops. Royalty monies from the sale of The World of Construction and The World of Manufacturing software are now being used to support these activities. The publisher is also continuing to provide assistance in helping to organize and support workshops and in-service teacher preparation apart from summer collegiate programs. In addition, McKnight has been very active and successful in helping school systems to obtain financial support and material assistance from local industry, business, and other sources.

The publisher has assumed the role of assisting project staff with slight modification of the instructional software to improve its use and to correct errors which would interfere with the educational value of the program. The publisher is also working cooperatively with IACP staff to monitor the design, development, and distribution of the IACP hardware which is being developed and manufactured by Damon Engineering, Inc., currently the official educational hardware supplier for seven major curriculum projects.

It is apparent that the efforts of the USOE, IACP staff, publisher, and the numerous professional educational and industrial groups and resource people who assisted with the development of the IACP industrial system have been somewhat successful. It is projected that the program will be taught in all of the 40 largest metropolitan areas of the country during the coming school year, as well as in nearly every state of the union, Canada, Puerto Rico, and in the Department of Defense schools in Germany and Italy. The publisher has reported that current enrollments are right on target according to their 1970 projected enrollment figures listed previously in this report, thus providing some credibility to the instructional system and the cooperative efforts of the IACP team.

FUTURE

The IACP is officially terminated, although "project" activities continue to flourish. The future of the IACP instructional system will have to be judged on its continued acceptance by the profession.

The headquarters and field staff will most likely continue to work with local educational agencies and industrial groups to help promote the IACP instructional system and to provide professional assistance with the installation of programs. A related task is the preparation of teachers. We assume that the 78 colleges and universities who will be offering 127 workshops this summer for over 3,000 industrial arts teachers will also give some consideration to the modification of their pre-service undergraduate programs to reflect the concept of industrial technology and rationale of the IACP. We have received reports from several leading institutions who have already begun to implement such curriculum change.

Since the adoption of IACP has continued to increase steadily since it was made commercially available, it is probably safe to assume that other educational publishers will develop and distribute similar educational systems when the copyrights on The World of Construction terminates in December 1975 and The World of Manufacturing in December 1976. Project staff are restricted by the USOE copyright laws to engage in any modifications of the program for personal gain during these copyright periods. However, it is recognized that former project staff have the talent and experience to undertake such tasks, if they desire, when the copyright period has terminated.

In closing, I would like to call your attention to the massive emphasis being placed on "career education" today. It is interesting that the IACP preceeded the career education concept by several years. In fact, Dr. Sidney Marland, U.S. Commissioner of Education, has identified The World of Construction and The World of Manufacturing as two developed packages which meet the educational needs of career education and also suggested that the IACP system be used as referent for the development of future career education materials. The Industrial Technology Education staff at OSU is currently working with the Center for Vocational and Technical Education at OSU on the development of the Model One, School-Based Career Educational materials.

Finally, a need exists for the upward and downward extension of relevant industrial arts curricula which may be based on the IACP rationale. The staff sees as its responsibility working cooperatively with our colleagues in education, business, industry, and government to continue and expand efforts in curriculum research, development, evaluation, and dissemination. Through the concerted and cooperative efforts of interested educationists, we can expect to foster educational change and witness the "fruits" of the professional growth of industrial arts education.

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Learning Experiences in Technology—Project LET

Paul Kuwik

The Learning Experiences in Technology Project has been developed jointly by the School District of Royal Oak, Michigan, Eastern Michigan University, and Oakland Intermediate School District. The project is an innovative model elementary school program designed to familiarize students with the concepts of technology and the elements of career exploration inherent within the concepts. The project is financially supported by the Michigan Department of Education for a three-year implementation period.

The following learning assumptions have formed the basis for the development of the project:

- Children are innately curious; they like to explore and are creative;
- Children learn best when anxiety levels are low;
- Verbal abstractions should follow direct experience with objects and ideas;
- If an individual is involved in and having fun with an activity, learning is taking place;
- Children learn from other children as well as adults;
- Active exploration, offering a wide array of manipulative materials, will facilitate children's learning; and
- Confidence in self is highly related to capacity for learning.

The project formally began in the summer of 1971 with a pre-school workshop for all participants. From a population of 18 elementary schools within the school district of Royal Oak, Michigan, seven schools were randomly sampled to serve as the pilot schools for the first year of the project. These schools represent all ranges of social and economic strata within the school district. From within the seven selected schools, 20 teachers represent all grades, one through six. Following summer in-service education, the teachers in the project utilize the tools, materials, and processes of technology in relating traditional studies in a more concrete manner around a career awareness theme. The project is not intended to be an additional subject, but, rather, a method of implementing all instruction in the elementary school curriculum. The project enables teachers to provide an active learning environment for over 600 children. Bi-weekly in-service sessions throughout the school year allow the teachers involved to update their knowledge of the concept of the project. "Learning by doing" is the theme of Project LET. Teaching by telling is minimized. The teacher is therefore a diagnostician and a facilitator of learning, working as a team leader with resource teachers, parents, community resources, and teacher aids.

The following general objectives serve as parameters for the Project. As a result of his or her experience, each child should understand his or her role in our changing technological society, recognize the rewards of work, appreciate the necessity for career exploration, explore a wide range of man's technologies, and understand man's environment through relating a wide variety of school experiences to the world of technology.

Project "LET" has both a content and methodological base. The content base for the project is spiral and additive in nature, specifically designed to present concepts of technology, focusing on career awareness. Technology, as defined for use by the project, is the knowledge of practice; the knowledge of the way man does things. Utilizing the 15 occupational clusters of the U.S.O.E. as a content parameter, concepts have been identified within the primary (1-2), intermediate (3-4) and upper (5-6) grade level groupings. Relating the concepts of technology within a specific scope of environment taught at each grade grouping, the concepts are constantly reinforced as they are covered in greater depth. Examples of the concepts within grade level groupings are listed below:

Primary (1-2) Grouping

Concepts	Scope of Environment
People and their occupational roles; what people do, where they work, why they work, occupational characteristics, responsibilities, etc.	Families, schools, communities.

Intermediate (3-4) Grouping

Concepts	Scope of Environment
People and their job roles that relate to management, production, and servicing.	Families, schools, cities, states, national

Upper (5-6) Grouping

To spiral through 1-4 concepts and include in greater depth:

Concepts	Scope of Environment
People and their job roles that relate to management, production, servicing, personnel.	Families, schools, cities, states, national, international, and interplanetary.

The preceding groupings, for purposes of implementation, have been ordered to greater specificity for the development of operational practices of classroom content.

The methodology employed by the project to implement the concepts previously discussed is the Integrated Teaching Unit. The teaching units are evolutionary in nature, as they are developed by the classroom teachers who understand the concepts of the project. After a unit is developed by a classroom teacher within in-service sessions, it is implemented within a classroom and revised before it is shared with other teachers in the school district. Each unit involves the following components: has hands-on activities, correlates with academic subjects, includes information about technology, involves resource people in presenting information about their occupations, incorporates role playing, has parental involvement, and includes field trips.

The success of this project is enjoyed because of the direct involvement of the elementary classroom teacher in the planning and implementation of the curriculum. As previously mentioned, Eastern Michigan University personnel directed a pre-school two-week summer workshop to familiarize the teachers with the content and methodology of technology for the elementary child. Following this workshop, teachers are involved in a bi-weekly half-day in-service program throughout the school year. Under the direction of Eastern Michigan University, teachers develop integrated teacher units, exchange ideas, and further develop an understanding of the content of technology for career awareness.

The entire development of the project is in the process of on-going evaluation by the staff of the Oakland Intermediate School District. The evaluation being developed, with the "PACER" model, could serve other districts in evaluating similar programs.

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Conceptual Organization of Content for Industrial Arts Production

James F. Fales

As clearly evidenced by current innovative industrial arts curriculum efforts, there is a definite trend toward the placement of emphasis on concepts, with less emphasis on perfecting skills. The following material is offered in the hope that those teaching in the various traditional fields of industrial arts might be able to adopt some of the curricular innovations recently established. The writer proposes that the following organization of subject matter content will provide for continuity to the student taking successive years of industrial arts during his years in the secondary school.

All too frequently, for example, a student in one industrial arts course learns a specific method for separating a specific material. The same student, taking another industrial arts course at a later date, learns other methods for cutting other materials. Is it possible to have the student understand that specific practices, regardless of material, belong to common categories of production processes? What is being proposed is an organization of content that would provide a conceptual framework to be taught in all industrial arts courses and to be used as a basis upon which to build additional subject matter while insuring that the student understands the commonality of all production practices, regardless of material.

Some products have many components, some have only one. All materials are made into components by either a forming or separating process, sometimes by both. The producer of components considers the material properties, the quantities wanted, the surfaces and tolerances needed to determine the most economical way to make component parts. The components are then combined to make subassemblies and assemblies.

Forming usually means changing the shape of a piece of material. A forming process starts with a single piece of solid material, or with a given amount of liquid or powder. At the end of the forming process, there is still the same amount of materials in the piece, but some change has taken place. All the forming processes can be put into one of three groups: casting or molding, compressing and stretching, and conditioning.

Casting or molding usually involves pouring or forcing of a material into a mold. The mold contains a cavity of the size and shape wanted in some part. The material may be liquid or a powder. Casting or molding consists of one-shot molding processes and permanent mold processes. In a one-shot molding process, the molding is destroyed after a single use. Some of the major one-shot molding processes are: sand casting, shell mold casting, and investment casting. The on-site placing of concrete is also a one-shot molding process. The major permanent mold processes are permanent mold casting, die casting, injection molding, centrifugal casting, and slush casting. In a permanent mold process, the mold may be opened to remove the molded part. The mold can then be closed and used again. In some cases, the mold is made so the molded part can drop out.

WOODS

F O R M I N G	CASTING OR MOLDING	ornamental foam casting
	COMPRESSING AND STRETCHING	laminating bending waterskis
	CONDITIONING	steaming wood wood welding rot treating
S E P A R A T I N G	SHEARING	chiseling cutting veneer
	CHIP REMOVING	sawing, filing, sanding drilling, turning
	OTHER	breaking scribing formica wood burning
C O M B I N I N G	MIXING	wood paste filler fiberglass paints, glue
	COATING	lacquer varnish, etc. wax
	BONDING	adhesive gluing
	MECHANICAL FASTENING	screwing, pegging nailing clamping

Figure 1

The major categories of compressing and stretching processes are: forging, compression molding, rolling, bending, and drawing. Forging, rolling, and compression molding processes use compressive forces for shaping the component. Both compressing and stretching occur when components are formed by bending and drawing processes. Stretching or tension forces are used for forming the component in drawing processes such as vacuum forming, stretch forming, and blow molding. Drawing usually involves stretching a material over a die to give it a certain shape. Drawing is sometimes called stamping.

In forming by conditioning, a material usually changes in its internal structure or form. Usually there is no visible, external effect. Conditioning processes are performed primarily for one of two reasons: to make the material easier to work during processing or to give the final product a particular quality or desired characteristic.

The major categories of conditioning processes are thermal conditioning, chemical reaction, and physical or mechanical deformation processes. Thermal conditioning requires the addition and the withdrawal of heat in various amounts, sequences, and lengths of time. Heat treating processes are the most common types of thermal conditioning. A chemical reaction rearranges the material's atoms so that a chemically different substance is formed. Sometimes heat is required to aid the process. Physical or mechanical deformation during the working of the material will affect its internal structure.

There are three ways of separating materials: by shearing, by chip removing, or by other processes. Shearing is basically a way of separating or dividing material with no loss of material for the purpose of dividing or imparting shape. By means of a mechanical advantage, usually a machine, a large force can be concentrated at a specific location along a sharp edge or blade. If the material is softer or weaker than the cutting

METALS

FORMING	CASTING	sand casting die casting
	COMPRESSING AND STRETCHING	brake forming roll forming forging die stamping herf spinning
	CONDITIONING	annealling tempering case hardening
SEPARATING	SHEARING	squaring shear hole punch tin snips nibbling cold chisel
	CHIP REMOVING	filing turning shaping drilling milling grinding
	OTHER	etching oxy-acet. cutting EDM
COMBINING	MIXING	alloying
	COATING	painting anodizing plating
	BONDING	welding brazing soldering epoxy gluing
	MECHANICAL FASTENING	riveting tapping threading

Figure 2

edge, the material will fail, or separate along the cutting line. After the material has been sheared, the combined length of the two pieces produced will match in length the original, unsheared piece. In a shearing operation, no material is lost along the cutting line. Stock can be sheared to various shapes; the edges are not always straight lines. A punch and die can be used to shear circular holes in a piece of stock. The die is stationary and is used to provide a mating surface for the punch; force applied to the punch will shear stock to shape, over the cavity in the die.

The chip removing processes for separating materials involve removing unwanted material in the form of chips, sawdust, or other fine bits, using pressure on one or more cutting edges. The tool is harder and tougher than the material. It will remove chips of the material to divide or impart shape to the stock. Some material is lost along the parting line. When material is separated to size by chip removing, the piece or pieces that remain are smaller than the original piece of stock because of the lost chips or fragments.

Advances in technology have placed unusual demands on the material separating industries. New processes of separating materials have been developed to supply these demands. Many of these separating processes use nonmechanical energy sources, such as chemical, electrical, or thermal energy. These processes may be broken into four groups or categories: thermal erosion, chemical separating, electrochemical, and induced fracture separating. Examples of thermal erosion include flame cutting and the use of vaporization by laser beam. Examples of chemical separating would include etching and chemical milling.

A third category of new processes is electrochemical separating. The important

CRAFTS

FORMING	CASTING OR MOLDING	plastic casting ceramics (slip casting)
	COMPRESSING AND STRETCHING	bending aluminum peening glass slumping
	CONDITIONING	firing ceramics tanning leather plastic casting
SEPARATING	SHEARING	cutting leather and metal
	CHIP REMOVING	filing carving drilling
	OTHER	chemical etching glass cutting
COMBINING	MIXING	plastic resin slip
	COATING	glazing enameling
	BONDING	gluing soldering
	MECHANICAL FASTENING	riveting nails

Figure 3

process in this category is electrical discharge machining. Electrical discharge machining uses a tool connected to the negative terminal of a direct current power source. The material to be separated is mounted close to the tool and is connected to the positive terminal of the power source. Both the tool and the workpiece are submerged in a dielectric liquid, such as kerosene. This liquid cools the workpiece and carries away the particles removed during machining. When the direct current is turned on, sparks from the tool will remove or erode material away from the workpiece. When the electric discharge machining process has been completed, the hole or pattern in the workpiece will be exactly like the shape of the tool. Electrochemical machining is also included in this category.

The last category of processes that falls into the classification of separating by other processes is induced fracture separating. Either a stress line is produced in a material or a stress line was built into the material at the time it was formed. The material is separated along this line by applying force. Glass can be separated to size by induced fracture. A glass cutter is first used to make a stress line in the glass. Once this has been done, pressure along this line, either by tapping or pressing the line against a table edge, will cause the glass to separate.

Once components have been formed and/or separated from standard stock, they are combined with other components to form assemblies. There are four ways of combining: mixing, coating, bonding, and mechanical fastening.

Mixing is the movement of particles of two or more components until they are evenly distributed. These particles might be molecules that are too small to be seen, or they might be large, visible particles. The particles may be solids, liquids, or gasses.

ELECTRICITY-ELECTRONICS

FORMING	CASTING OR MOLDING	embedded components in plastic
	COMPRESSING AND STRETCHING	bending chassis bending wire winding coils
	CONDITIONING	revitalizing batteries
SEPARATING	SHEARING	punching holes cutting sheet metal cutting wire
	CHIP REMOVING	filing drilling, etc.
	OTHER	chemical etching
COMBINING	MIXING	making electrolite solution
	COATING	insulating
	BINDING	soldering spot welding epoxy gluing
	MECHANICAL FASTENING	taping twisting crimping riveting wire nuts

Figure 4

Coating means applying one material over another. Often a thin layer of one component is spread over the surface of a second component. It is a physical coating if the two components do not mix. The evenness and thickness of the coating layer are controlled by the process of application. Some components are coated chemically. The coating components mix or combine chemically with the coated component.

There are two ways to bond components. One group of processes is called adhesive bonding or adhesion. For adhesive bonding, an adhesive material such as paste, glue, or solder is applied. It creates a surface bond between the two components. The molecules of the adhesive attach to the molecules on the surface of each component. Hardening or curing usually causes the bond between molecules to grow stronger. Fusion bonding means that molecules from each component are mixed together at the joint or interface. The components are placed close together; heat and/or pressure is applied; the surfaces become liquid, and the molecules of one component mix with the molecules of the other component. When the heat and/or pressure is removed, the mixed molecules become solid and form one material.

Mechanical fastening uses friction or mechanical force to hold components together, either permanently or temporarily. Bolts, screws, and studs are classified as threaded fasteners. Thread, lace, rope, wire, rivets, nails, and keys are examples of nonthreaded mechanical fasteners. Most mechanical fasteners permit the assembly to be taken apart easily.

It can be seen from the foregoing material that a conceptual framework is possible for industrial arts production courses. In order to apply this classification of industrial production practices to some of our industrial arts courses, let us relate our everyday in-class activities to these categories. Figures 1 through 5 indicate how we can relate our laboratory activities to this conceptual framework.

GRAPHICS

FORMING	CASTING OR MOLDING	linotype rubber stamp
	COMPRESSING AND STRETCHING	folding paper
	CONDITIONING	photographic developing adhering stencil (lacquer) rubber stamp
SEPARATING	SHEARING	cutting screen stencils paper cutter stripping offset plates punching holes arc cutting
	CHIP REMOVING	rubber stamp blocks sawing
	OTHER	
COMBINING	MIXING	photo chemicals paints and inks
	COATING	sensitizing offset plates printing (any method)
	BONDING	padding book binding
	MECHANICAL FASTENING	locking type in chase stitching stapling

Figure 5

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Ecology

An Environmental Resource Recovery Project for Industrial Arts

Delmar W. Olson

Industrial arts is being offered an invitation to participate in and contribute to the very critical national problem of environmental resource recovery. As we sense the importance of the preservation of the planet, we can easily see industrial arts as being necessarily involved, especially if the school itself accepts its environmental responsibilities. Technology in a very real sense is man consuming, altering, and even destroying his planet. Industrial arts, if it will function as interpreter of the technology for the American school, must be concerned with the impact and consequences of technological advance not only for man himself, but for the survival of the planet on which he depends for existence.

The environmental resource recovery to which we refer herein is essentially the re-utilization of solid wastes. These are the materials composing the eight pounds of solid wastes generated daily per American. They commonly include paper, metals, glass, plastics, rubber, wood, textiles, and garbage. We are advised that if we continue to consume the planet at the existing rate, certain of its natural resources will be depleted in a matter of a new years. For example, we have zinc enough for only 20 years, tin and petroleum for 30, and natural gas for 13. As Americans, we have but 6% of the planet's population, but we consume 30% of the world's energy.

The tremendous production of material goods, their consumption, and then discard must be a matter of personal as well as national concern. We are the world's greatest producers of junk, and until recently, we sensed little difficulty in its disposal except that it was becoming increasingly expensive. Dumping, burying, and burning have been the standard practices since man began to discard what was no longer useful to him. The problem facing our cities, urban, and rural areas is not how to more efficiently dump, bury, or burn solid wastes, but rather, how increasing amounts of these wastes can be recovered and reused. On the one hand, our primitive methods of disposal cause extensive pollution of the air, water, and land; on the other hand, we can make use of them as America's "new material resource." This is where industrial arts comes in.

OBJECTIVES OF THE RESOURCE RECOVERY PROJECT

The resource recovery project has several specific objectives, all of which are operable within the general functions of industrial arts, and because of this, the project can be seen as a vehicle for the implementation of the functions.

The project is intended to acquaint the student with:

1. Solid waste as the "new resource": material composition and identification, energy capability, and economic value.
2. The nature and extent of the accumulating problems and issues caused by solid waste disposal: societal, personal, cultural, environmental, health, safety, survival, economic, technical, planet depletion.
3. The state of the technology of traditional methods of solid waste disposal: types, limitations, methods, costs, pollution, space consumption.
4. The new technology of solid waste recovery: principles, systems, operation, limitations, applications.
5. And finally, to involve the student in the search for better ways of solid waste disposal, minimization, recovery, recycling, and reuse, through study, research, experiment, design, and development of pertinent ideas.

CONCEPTS TO ANALYZE

To stimulate awareness and increase student sensitivities to the problems of solid waste disposal as well as of resource recovery, the following ten concepts can be used for study, discussion, field trips, research, and the like. Within each there are many issues, questions, and other concepts. These are revealed as penetration progresses. Some typical questions are included here.

1. The quantity of the planet's natural resources is fixed, limited, and can be depleted.

Questions: What natural resources does the planet provide? What are the known limits of their supply? What will happen when some of them are depleted?

2. Inorganic materials are not replaceable in nature, as are the organic.

Questions: What are inorganic materials? Why are they not replaceable? Can organic materials replace the inorganic?

3. Those nations with the greatest technological development are the heaviest consumers of the planet's resources.

Questions: What does the technology have to do with the consumption of these resources? What is this thing called "technology"? Which man-made products consume the most materials?

4. The need for materials and energies increases with population increase and with the rise in the individual's level of consumption.

Questions: Does the planet have enough materials to supply an unlimited population? What will likely be the consequences to the planet of a continuing population explosion? To make room for more people, what might we have to give up?

5. America's greatest national production is junk and waste.

Questions: Can we be proud of this distinction? What problems does this production cause? Is it feasible to recover the materials in a discarded automobile?

6. Solutions to the problems involved in the preservation of the planet may require new applications of science and technology.

Questions: What is this called the "new technology"? How is this different from the old technology? Is it really new?

7. The consumption and depletion of the irreplaceable materials of the planet can be slowed and controlled.

Questions: What methods are feasible for slowing their consumption? Will controls be necessary? What kinds of controls?

8. Solid wastes are man's new material and energy resources. Trash can become treasure.

Questions: What does recycling mean? What products and materials are not biodegradable? What are the successful systems of resource recovery?

9. Acceptance of solid wastes as a new materials resource requires a change of attitude by the consumer.

Questions: Is the old adage, "You can't make a silk purse out of a sow's ear," still true? What does it imply for resource recovery? Can you design an item from junk which will not be junk when completed?

10. When industrial arts uses recovered resources in its student projects, new kinds of projects requiring new kinds of tools and machines may be necessary as well as appropriate.

Questions: Industrial arts itself is a producer of solid wastes from project construction. Should we use only materials which are recyclable? Can we recycle any of these materials ourselves?

SOLID WASTES AS MATERIAL RESOURCES FOR INDUSTRIAL ARTS

The content of solid wastes typically includes such materials as metals, glass, wood, plastics, textiles, leather, paper, rubber, as well as quantities of other materials. In addition, there are items such as furniture, large and small appliances, toys, sporting equipment, bicycles, vehicles, electrical and electronic gear, musical instruments, machines, and other consumer items. There is also the scrap from manufacturing industries and discarded items used in business, institutions, and the military. These materials and products can be divided into five groups for use in industrial arts. These we shall refer to as the 5 R's in resource recovery.

1. Reusing Materials

Reusable materials are discarded manufactured materials in usable form which can be converted to uses other than those for which they were originally intended. They appear as short lengths, factory rejects, scrap, and parts of products. They may be expected to include:

Metals—sheet, rod, bar, tube, angles, pipe, wire, steel, iron, copper, brass, and aluminum are most common.

Woods—lumber, veneers, laminates, slabs, ends, particle board, remnants.

Paper—sheet, card, boxboard, tube.

Plastics—sheet, film, block, rod, tube.

Textiles—fibers, rags, yarn, thread, cord.

Fasteners—bolts, nuts, screws, washers.

2. Restoring Original Products

Discarded, broken, or worn manufactured products can at times be economically reclaimed, renovated, renewed to their original condition for further use as originally designed. The list includes such items as furniture, toys, machines, tools, utensils, small and large appliances, radios, sporting goods, and antiques.

3. Redesigning Products

Discarded items may be converted to uses other than those originally intended by combining, adapting, and modifying parts and assemblies. This is a fertile field for young inventors and gadgeteers. Consider these possibilities and add to the list: home workshop machines and equipment designed from parts of automobiles, appliances, farm machinery; wood lathe, jig saw, grinder, disc sander, and potters wheel; new toys created from parts of discarded toys; "psychological" playground equipment from boxes and containers; new ideas in furniture from discarded pieces and from items not originally used as furniture; electrical, electronic and mechanical learning aids, models, mockups from discarded parts and components; play vehicles from old tricycles, bicycles; kindergarten and primary school learning aids; classroom equipment such as pet cages, terrariums, bird feeders from odds and ends.

4. Recycling Materials

Original materials in products and scrap can be converted into usable materials for remanufacturing in the industrial arts laboratory; for example: Old paper can be made into new paper; old metals can be melted into ingots, depending on the available heat; old textiles materials may be reduced to yarn, thread, fibers; old plastics solids might be converted into liquids, for casting; old glass can be crushed into aggregate for cement, concrete, glazes; old rags and fibers can be converted into paper; wood chips and shavings may be made into new materials with the aid of liquid plastics.

5. Remanufacturing

The recycled materials are remanufactured into usable items as aluminum, brass, bronze ingots into castings, glass cullet into glass and ceramic glazes, liquid plastics into castings and sheets. Yarns and thread may be woven into new textiles materials. The new paper can be used in graphic arts, as well as material for new types of construction, replacing wood and metals.

ABOUT SOLID WASTES

To determine what your students know or do not know about solid wastes and resource recovery, try some of these questions on them. They open up fields for study, exploration, and activity, and suggest ideas for projects. You can start with any of the topics listed here. Use movies and field trips to stimulate thinking.

1. What are solid wastes? Of what materials are they composed? Is litter solid waste? Has the nature of solid waste changed in recent years? What are the major types of solid wastes?

2. What are the sources of solid wastes? What part does the home contribute? What are those produced by industry? Does farming produce any? Are there other sources?

3. What is the nature of the solid waste problem? What has caused the problem? Is it a modern problem, or is it an old one? What are the dimensions of today's problems? How does the local problem relate to the national? Do solid wastes pose dangers? How do solid wastes relate to the environment? Are solid wastes related to pollution? What is there to get "bugged" about?

4. How do we get rid of solid waste? What are the traditional methods? How does your community dispose of it? What does it cost to dispose of it? What are open dumps? What is a sanitary landfill? What is incineration?

5. Are there better ways for disposal? What is the difference between disposal and recovery? Why must the traditional methods be replaced?

6. What new forms of disposal and recovery are being used? How are the different materials sorted out? How is trash collected? What does recycling mean? Pyrolysis? What materials are presently being recycled? What are the new industries involved? What jobs are included?

7. How can solid wastes be considered man's new resource?

EDUCATIONAL VALUES AND OUTCOMES IN THE RESOURCE RECOVERY PROJECT

The student participant in the Resource Recovery Project can be expected to gain essentially the same values and outcomes from his work here as in a regular course or program of industrial arts. Because of the nature of the project, with its high priority in national attention, however, the participant is likely to be motivated by a strong sense of civic responsibility. As a result, the values and outcomes are likely to be intensively real, meaningful, and timely, possibly more so than those in a regular course of industrial arts.

The values and outcomes for industrial arts are identified in six blocks or categories: technical, occupational, consumer, recreational, cultural, and personal-social. The following are anticipated values and outcomes in each:

The Technical

A degree of mastery of materials, tools, machines, and processes can be expected from participation in the project, just as in a regular course. In addition, the following can be realized in the way of knowledges, appreciations, sensitivities, and skills involved in:

1. Understanding the physical and chemical nature of materials in solid wastes: identification, characteristics, uses.
2. Understanding the nature, uses, limitations of industrial products discarded as solid wastes: appliances, toys, machines, etc.
3. Understanding the principles and applications of industrial processes used in the manufacture of materials and products as common in solid wastes: glass and glass products, paper and paper products, etc.
4. Engineering principles and applications in resource recovery processes currently in operation in cities and industries.
5. Research, experiment, drawing, design, development as applicable to materials recovery, products restoration and redesign, and waste disposal applications for the home.

The Occupational

Development of the technology of resource recovery is expected to be accompanied by the development of totally new industries, as well as new types of jobs. The design and manufacture of the new types of equipment and systems needed in disposal and recovery are expected to provide jobs not before existent. It is conceivable that the industry of disposal and resource recovery may employ as many persons as do the manufacturing industries.

The classifications of occupations included in waste disposal and resource recovery will likely include engineers, chemists, designers, systems analysts, technicians, machine operators, maintenance men, truck drivers, and the like, along with management and office personnel common to all industry. Since the project brings the student into actual contact with people at work, he will get a first-hand acquaintance with the occupations. The student's involvement in the project gives him actual tryout experience in many kinds of occupations.

The Consumer

Participation in the project will likely add a significant diversion to the consumer function of industrial arts. For example, it can be expected that the student will become more aware of and sensitive to the role of the consumer in the problems of solid wastes. He will likely add disposability and degradability to his list of guides for the selection of consumer products. He may be moved to change his order of priorities for the selection of consumer products. For instance, if he sees the need for minimizing solid waste, he may be inclined to add weight to durability and longevity in consumer product selection. It is known that children play an increasing part in the family decision-making on automobiles, recreational gear, clothing, furniture, and such.

The Cultural

Values and outcomes of a cultural nature represent knowledge, understanding, sensitivities, appreciations, and concerns for the world of man-made things. This includes technological achievements, techniques, processes, standards for excellence, comparative design, leaders, inventors. The study of the relationships of man and technology, technology and environment, and man and environment bring the world of man-made things into reality. The student is introduced to a logic and philosophy respectful of man, nature, the planet, and technology.

The Recreational

The impact of his participation in the Resource Recovery Project can be expected to show in the student's recreational activity when it includes working with materials, tools, and machines as in a home workshop. The challenge to create and to produce with discarded materials can be as great as from purchases of new materials. The opportunities for worthwhile activity in restoring, renewing, and redesigning items will be unlimited. The design and development of workshop tools and equipment from discarded items will attract the inventive type of person.

Personal-Social Growth

The discovery and development of self, including the release and realization of that self by means of experience, expression, and achievement within an environment which is both technological and social, represents the human concerns of industrial arts. In the Resource Recovery Project, it is assumed that this goal is fully functional. It is expected, however, that with the student participating in the search for solutions to problems of solid waste disposal, he will sense the urgency, the reality, the necessity for his participation. Such involvement through industrial arts must add maturity, meaning, and seriousness to his experience. Perhaps with this, he becomes a more responsible citizen and human.

CONDUCTING A RESOURCE RECOVERY PROJECT IN INDUSTRIAL ARTS EDUCATION

There are two basic types of instructional organization for any program of industrial arts. There are also various degrees of combination of these two types. The first is the customary teacher-structured, sequential schedule of problems, exercises, projects, or units. The second is the research and development plan. This is student-centered and structured and involves him in meeting challenges to come up with new and/or better ideas for dealing with technological problems. This takes him into study, research, design, experiment, invention, development, construction, test, and evaluation using a variety of resources and resource persons. The great differences in these two types of organization lie in the role and objectives of both teacher and student. Either is appropriate and functional. Teachers and students are generally more comfortable in one than in the other.

The Teacher-Designed Program

Among the 5 R's of resource recovery, a teacher can design a course of study around any or all of the R's. The student activity in project development can progress from easy to difficult through a series of teacher-designed or suggested constructions. The degree of teacher-design in a course can be expected to vary with the achievement potential of the students. This plan is easily oriented to the development of projects of a take-home nature. The teacher can place much or little emphasis on student creativity in the development of the ideas. Most of the project activity here is likely to be found in the first two R's: reusing materials and restoring original products.

The Research and Development Plan

The teacher who employs the research and development method as the means to discovering and developing new or better ideas assumes that his students have the necessary intellectual capability and drive to explore intelligently and systematically. They are capable of creating, designing, inventing, and are not easily defeated or deterred. A single student or an entire class can function as ideators, experimenters, and developers. Action begins with the recognition of a problem triggering the imagination. It takes the student to the library and to resource persons, such as engineers in the community. He may visit industries or correspond by letter and telephone. His teacher becomes his chief resource person and consultant in the search for ideas, solutions, and aids. Experimentation leads to the construction of a model or simulation of his proposal along with the necessary engineering-type report. Test and evaluation of the proposal may indicate the feasibility or lack of it. With the teacher's counsel, the student decides the next steps.

Information retrieval is a key part of the research by the student. He accumulates a bibliography as he goes. When students work in groups on the same project, one or two of them can serve as the readers and retrievers for the others.

The R and D approach knows no formal structure. It is loose, open-ended, and free-wheeling as it recognizes problems, seeks out solutions, and dreams up proposals. It appeals particularly to the student who is most comfortable when he is creating ideas. The last three R's especially invite this student and his teacher: redesigning products, recycling materials, and remanufacturing.

SOME STUDENT AND TEACHER AIDS

Publications by the National Industrial Pollution Control Council, Washington, D.C. 20230. These are available from the Superintendent of Documents, U.S. G.P.O., Washington, D.C. 20402.

1. The Disposal of Major Appliances. Sub-Council Report, June 1971. 25¢.
2. Glass Containers. Sub-Council Report, February 1971. 25¢.
3. Junk Can Disposal. Sub-Council Report, March 1971. 40¢.
4. Paper. Sub-Council Report, March 1971. 40¢.
5. Plastics in Solid Wastes. Sub-Council Report, March 1971. 25¢.
6. Rubber. Sub-Council Report, October 1971. 20¢.
7. Wood Products. Sub-Council Report, February 1971. 25¢.

The Council on Environmental Quality. Second Annual Report, August 1971. Environmental Quality.

Superintendent of Documents, U.S. G.P.O., Washington, D.C. 20402, $2.00, No. 4111-0005.

Glass Container Manufacturers Institute, Inc., 330 Madison Ave., New York, New York 10017

1. The Litter Fact Book
2. The Solid Waste Fact Book

National Center for Resource Recovery, 1211 Connecticut Ave., N.W., Washington, D.C. 20036

Information Kit

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Technology and the Environment in Interface: Imperatives for Industrial Arts

E. Allen Bame

Ecology—Environment—Pollution. In the past several years these have become household words, as concern for the condition of the environment has grown to world-wide proportions. This appears to be not another fad or fleeting fancy of the times but a genuine concern of long duration. Of course, the "doomsday prophets" would have us believe that all is lost and we have only to wait for the grim reaper to appear in a cloud of air pollution. At the same time, there are the optimists who profess the belief that all is well, and soon all our problems will be solved by that great, though nebulous, thing we call technology. Neither of these views appears to be realistic, for each implies an attitude of "sit back and wait for what is bound to happen." To do nothing is to lose the battle.

In an attempt to get some light through the maze of symptoms that seems to surround the issue of environmental illness, a study is now in progress at North Carolina State University in Industrial Arts Education to explore what we are calling the Technology-Environment Interface, that area of commonality between technology and the environment. This is aimed at the identification of concepts inherent in the interface which will be used as a foundation for further development of educational programs. An integral part of this is the identification and clarification of the role of industrial arts in environmental education.

Several concepts are emerging from the study that appear to be vital to an understanding of the technology-environment interface. The first of these is the idea that man is a part of nature. Ferkiss calls this the "new naturalism" which asserts that man is not outside of nature but an integral part of it. It is rather apparent that man also holds the highest position in nature. The structure of his hand and the complexity of his brain put him in this position.

Related to this is the realization that everything in nature is interconnected, including man, which Ferkiss calls the "new holism." In this view, all men are linked with each other and with their social and physical environments. Man is a part of the ecological community of the Earth and must function within that community. Man is dependent upon other elements of nature: the plants, animals, the earth. In this view of holism, all of man's technological decisions must be made within this community, for nothing is isolated.

The new naturalism and the new holism demand a new way of viewing life—an ecological view. Commoner suggests that we canno longer rely exclusively on the scientific method of investigation to solve our problems. In line with the holistic view, he states that the ecosystem cannot be divided into manageable parts, for its properties reside in the whole, in the connections between the parts. He also states that the fault of technology appears to come from the fragmented nature of its scientific base. This reductionist methodology does not seem to be an effective means of analyzing the vast natural systems that are threatened by degradation. The holistic view of technology seriously questions the scientific method of investigation, long the primary procedure for man's study of his environment.

If man is a part of nature, as this concept asserts, then it is imperative that he maintain a positive position in the environment where he is a contributor rather than a detractor from it. He must insert himself, through his technology, into the environment and its natural ways rather than attempt to stand outside as a controller or master. An ecological perspective must be developed, for no decisions can be made outside of nature. Every technological act is made within nature.

Out of this grows the concept of technology as man using nature. Forbes states that technology may be considered, from the biologists' point of view, as the instrument with which man seeks to gain an increasingly firm grip on his own evolution. It is the product of interaction between man and environment and has guided man in his conquest of nature. Technology has always been the extension and improvement of the material culture by the observation and use of nature.

This concept of technology using nature also becomes rather obvious with only limited investigation into the historical development of man and his technology. Civilization, as we know it today, began with man's first attempts to convert the materials he found in nature into articles that would allow him to better cope with the environment in which he found himself. Possibly the first man-made environment was created when fires were built or taken into caves for cooking and warmth. This unnatural environment allowed stone-age man to live a bit easier and to become more firmly entrenched on this earth.

When man uses nature, he is limited by what nature will allow him to do. This suggests a third concept: nature limiting technology—nature having ultimate control over man.

For the greater part of his history, technological man has been confined within rather narrow limits by nature. Stone-age man was limited to life in the temperate zones of the earth until he learned to harness and control fire to be used for heat and to make a covering for his body to hold in the natural body heat. His food supply was limited to what could be gathered from nature until Neolithic man domesticated plants and animals to be used for food. These same factors limited the numbers of man that could live on this earth.

Most contemporary technological achievements are based on a logical array of scientifically measured and checked data and facts—all determined within the laws of nature. Technology, then, does not in any ultimate way free man from the limitations of nature. Nature is the seed from which all technological developments grow.

In many ways, man, through his technology, is coming increasingly under the control of nature, for in using nature we place ourselves in a position of dependence. Our travel in airplanes, for example, is dependent upon the natural laws of aerodynamics. With our increasing reliance on this mode of transportation, we become increasingly dependent on the laws of nature applied in the design of the airplane. To design in such a manner as to defy these laws would, of course, be an exercise in futility.

Technology, as man using nature, changes the environment. This fourth concept in the technology-environment interface is very evident today and is a topic of seemingly endless discussion. Man as a part of nature and his technology as a force using nature have touched virtually every part of the natural environment. There is now serious question as to the availability of water and air in the pure, natural state. Air, water, and food—the three natural resources necessary for the survival of all animals, including man—are affected by man and supposedly in very grave condition.

This changing of the environment by technology has brought about serious pollution. There is considerable evidence that many of the new technologies now in use in advanced countries such as ours are in conflict with the ecosystem, therefore degrading the environment. Commoner points out that this degradation has come about since World War II through the increased use of synthetics. Natural organic materials have been displaced by unnatural synthetic ones. Once produced, these generate a greater impact on the environment than their natural counterparts.

The concept of technology changing the environment also has a positive side. Man's vista has certainly been expanded by technological progress; there has unquestionably been an enrichment of everyday living through technology. The natural and artificial environments have been merged with the purpose of developing a more pleasing and comfortable existence for man. There is also control, or at least modification, of natural acts such as erosion, wind, and temperature damage to crops, and the improvement and development of plants and animals for use as food for man. In this way, technology can be viewed as directly and indirectly improving the natural environment.

Closely allied with this is the concept of technology changing nature. This presupposes the separation of nature and the natural environment of man. Though seemingly counter to the holistic view presented earlier, this separation does seem plausible when consideration is given the fact that there is ample record of the elimination of elements of nature with no appreciable change in man's environment. Certainly, the demise of the great mastodons made the life of prehistoric man a bit easier. But the environmental effect on more modern man of the extinction of the passenger pigeon was certainly minimal, while there was a measurable change in nature. Each change, be it natural or man-made, has an effect on nature—there is a disturbance of the fragile natural equilibrium.

Man seems to be exploitative and his technology extractive. Minerals are extracted from the earth, processed into a new form, and eventually discarded and returned to nature. The form in which they are returned to nature is considerably less concentrated than when originally found. In this, there is a definite change in nature.

Man's domestication of plants and animals has caused a shift from the natural ecological diversity, often quite varied and complex, to the simplified ecology of food-producing man. Man has substituted a few domesticated species for the hundreds of plants and animals found naturally. Over-grazing and plowing year after year lead to loss of plants and to erosion, leaving a virtual desert where there was once lush growth. Salt deposits from intensive irrigation can make further agriculture impossible. Strip mining changes mountains into areas of virtual sterility.

In making the world over, man not only causes modifications in the environment and nature, but he also changes himself. This is a sixth concept that grows out of this interface between technology and the environment. There seems to be an imperative in the fact that technological change and its products have become a way of life. We have grown accustomed and possibly conditioned to accept technological innovation as a continuing way of life. The feeling by many that technology is the only solution to an environmental crisis is an example of this.

There is the possibility that man can adapt to present levels of environmental pollution to the point that it becomes a natural environment for him. This is suggested by the many species of insects that have developed a resistance to DDT. On the human side, the Northern Europeans seemingly have adapted both physiologically and culturally to the polluted air and damp cold of winter. They appear to cheerfully accept the environment, even though it appears unbearable to outsiders. This also occurs in other heavily industrialized areas where population seems to function effectively despite constant exposure to irritating substances in the air. In a related example, Ellul states that in the "human technique," man becomes the object of technology in forms ranging all the way from medicine and genetics to propaganda. In this view, as with that of McLuhan, man is seen as adapting to surroundings that he has made. Man is making himself. He is determining his own evolution.

A seventh concept seems to be emerging from this study that suggests a technology—environment—social relationship. The use of the term sociotechnological is suggested, for the interface is certainly not limited to the technical and material alone. It is a cultural, social, and psychological process as well. Attitudes, thoughts, values, beliefs, and the behavior of people are affected, though perhaps in a subtle way. Though technology is not usually considered a social science, the meaning of the processes and objects of technology lie in the social sciences, and therein lies the sociotechnological relationship.

In this relationship, the threats that are perceived in our environmental crisis are directly related to our social well-being. Historically, man's progress has been dependent on his technological progress. The condition of our natural resources and of our social well-being go hand-in-hand. It seems, then, that the technology-environment interface must go beyond mere scientific boundaries and into the realm of sociology.

At this point one can ask, and very honestly, "So what?" What does all this mean to environmental education, especially to the role of industrial arts in it? If industrial arts is to reflect technology in the American school, it is imperative that the technology-environment interface be included in its sphere of work. This is not to say that this concern is the exclusive territory of industrial arts, for just the opposite is true. These concepts make it clear that the view of the new holism must be adopted and put into practice by all of the disciplines, industrial arts included. Only an interdisciplinary effort will give proper representation to the study of the environment. Any fragmented approach will be incomplete. Industrial arts cannot do any better job of environmental education than any other single discipline. We can certainly teach some aspects of it better, but we cannot do it all.

The contribution that industrial arts makes to any interdisciplinary effort in environmental education must go beyond our present emphasis on industry. Though many of our pollution problems originate here, there are facets of this problem that lead into the very important realm of sociology that is now being overlooked by the limited industrial approach. We must look beyond this one aspect of technology and begin exploring, reflecting, and teaching the whole of technology.

In a recent issue of the "School Shop" magazine, there appeared an article that espoused this interdisciplinary approach to environmental education. It was concluded with the statement that the prerequisite for effective action is education. I would like to amend this slightly to say that the <u>imperative</u> for effective action is an <u>interdisciplinary</u> education. Anything less will overlook the sociotechnological relationships that exist in our world.

As a sidelight to this discussion and more a personal conviction than results from our study, there is one other imperative that must be mentioned. If industrial arts does not accept and then carry out this environmental education task, then someone else will do it, leaving us deeper in the position of saying we are a part of general education but doing nothing about it. Of this I am convinced. For me, the question is not what will be done, nor so much when it will be done, but who will do it. Will we accept the challenge or lose by default? The choice is ours to make. Now is the time to make it.

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An Outdoor Experience in Environmental Education for Industrial Arts Students

John J. Humbert III

We at Glassboro State College have been taking our students to an outdoor experience at Stokes State Park in New Jersey for the past several years. All the education majors, as a part of their practicum experience, study water samples, soil strata, wild life, and are given lectures on ecology by the park staff. The students' comments concerning this activity suggest that this is one of the highlights of their college career. Other outdoor experiences that have been conducted by the faculty and staff are field study trips to Florida, the Smoky Mountains, and many local areas in New Jersey.

Another activity that is popular is Outward Bound. This experience not only combines the challenging activities associated with Outward Bound, but can be incorporated into a study of the environment in which it is conducted. The Outward Bound activity conducted in this manner would interest most senior high and college industrial arts students, as evidenced by several one-day Outward Bound experiences that were conducted at Stokes.

Other environmental activities being conducted in the New Jersey at the elementary level include the concept of "the home environment." The activity would involve taking elementary students on tours of established communities of all socio-economic levels and to building sites. Part of the discussion, after returning to the classroom, might be concerned with "How do we keep the home clean?", "What can we do to improve the neighborhood?", or "Let's clean the small trash from the streets in our neighborhood." Activities that could be used are growing plants in several environments; demonstrating soil erosion, water pollution, land use and care; talks by leading ecologists; and field trips to study each of these areas. A cooperative field trip with an older group, such as elementary education majors as guides for the elementary students, could last several days and could be conducted in a state or national park as part of the educational experiences required by both groups.

The outdoor environmental experience to be discussed in detail can be used for the junior and senior high school students. In this case, juniors in college were the ones participating.

Several students who were taking the Practicum in Industrial Arts last year asked if they could plan their own practicum that would be a parallel experience with the usual activity at Stokes. They scheduled a meeting with the staff and discussed their ideas concerning an environmental education experience. They proposed a broadening activity that would take them to other parts of the country involving their own planning and direction.

Some of the advantages of this type of experience are: it takes the student to areas of the country where he has not been before; it requires group planning, which may be either teacher-guided or student-directed, depending on the capabilities of the students involved; it requires group living activities, which many students have not had before; and it provides a different emphasis on environmental study which cannot be obtained in the local area.

Several problems that might be encountered in planning for this activity are: parental permission for the outdoor activity; mixed groups of both boys and girls, and a racially mixed group; the expense incurred in the experience; finding accommodations for the group at the site of the environmental experience; and transportation. These and other problems were encountered by the college group as they planned for their practicum experience.

The group met informally, beginning in early September, to discuss methods of selecting other group members, possible activities and procedures necessary to secure permission to plan the outdoor environmental experience. The student leaders determined the size of the group, which was limited because of transportation and accommodations. The other members of the group were selected by writing a short paper stating their views concerning the environment and what they could offer the group by their participation. The paper was to be accompanied with a deposit or earnest money which would cover part of the expenses that would be incurred. Seven students were chosen to go on this Outdoor Experience. Two faculty members were added to bring the full complement to nine group members.

The members of the group were given various duties, such as: planning the itinerary; accommodations; transportation; contacting parks, industries, and schools to be visited; and menus planned for each day so that enough provisions could be obtained. One of the very interesting aspects of the whole activity was that the group did an excellent job of planning. Each day was fully planned and, at the end of the week, there were very few, if any, problems that were not foreseen.

We left Glassboro State College the middle of May, 1971, to travel to Maine. We arrived late in the evening, organized camp, and discussed the activity for the following day. At this point, we needed to be somewhat flexible, as some of the planned activities depended on the weather. One of the first activities the following day was to get the individuals to act like a group. Several activities were suggested that required group cooperation. After these activities were conducted, the group was much more cohesive and really began to function. Even the advisors were accepted as part of the group and were included in all the activities thereafter.

The activities for the week included fishing, photography, hiking, lectures by the park naturalist, a complete tour of the pulpwood operation from tree to paper, nature study, and a fly-in fishing trip in which we not only fished, but got an excellent overview of the conservation and ecology of the area. Other activities that were planned, but lacked time to complete, were timber cruising, soil study, and a visit to the University of Maine.

An interesting contrast was recognized between the pulpwood association and the state park. The pulpwood association's view of conservation was planned use of the land. They planned to cut every twenty to thirty years. This they considered excellent conservation and use of their land. On the other hand, the state park was more concerned with leaving nature as it was. They said this land was for nature study, and that nature would take care of its own.

In summary, an outdoor environmental experience of this nature could include many different activities that were not discussed. This was purposely done, as much of the planning is left to the students. The advisor's function is one of guiding and coordination to see that nothing is overlooked concerning all aspects of the experience. If you let the students plan, they will probably do a better job and be more creative than the teacher or advisor.

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Industrial Arts and Pollution

G. E. Baker

Environmental protection is a major topic today, with industry as a whole receiving the brunt of the criticism. Politicians, industrialists, scientists, students, housewives, government officials, and almost everyone views with concern the problems of pollution. Traffic cops in Tokyo must return to the station every few hours for oxygen treatment, Dutch tulip growers are reimbursed by steel mills when their crops are damaged by smokestack effluents, and in the Soviet Union controversy rages between conservationists and industrial developers around Lake Baykal, where wood pulp factories are being constructed.

There are several factors that contribute to these growing dangers. First of all, during the past few decades, the world population has doubled. Secondly, coupled with the increased population, a rapid increase in the quality of living has used more resources and energy per person. For example, the world usage of paper and paper products should grow from 80 pounds per person to over 110 pounds per person in 1980.

Conservationists estimate that the world's resources can comfortably support the more than 3 billion people in the world today. However, if the population doubles again before the turn of the century, the sewage alone from just a primitive culture would be sufficient to pollute the earth's rivers and streams.

Many people criticize industry because it uses products and raw materials and appears to be the major pollution source. Others criticize industry because it does not immediately provide pollution controls. Although history shows that people and industry have had a callous disregard for our environment, both people and industry today appear to realize the need for controls and are attempting to develop controls. Ayn Rand, the noted novelist, philosopher, and environmentalist, considers the anti-industrial environmentalist as being sinister. She states that man's greatest benefactor is technology, and to denounce it is not to love mankind but to kill it. This implies that the solution to a safe environment in a populous industrial society lies in man's ability to control his environment and his processes and to make them work for his best good.

Man's industry is apparently as essential to his large population as his environment. D. C. Burnham, the chairman of Westinghouse Electric Corp., cites three segments of society which must act together in the solution of our large environmental problems. The first segment is the educational institution, which should teach facts and change attitudes; the second segment is government, which should coordinate efforts and enforce rules required by the society; and the third segment is industry.

Richard Madden, the president of Potlatch Forests, Inc., declares that the dominant reason for the existence of an industry is to earn a profit. He also maintains that it is possible for industry to make a profit and not be detrimental to the welfare of the people.

PROGRESS BY INDUSTRY

Industry's good intentions are more than words. Great amounts of money, time, and facilities are made available for the study of environmental problems and to support research and education. Cleaning the world's air and water and getting rid of its solid wastes is an expensive proposition. Not only is it expensive, but it is an industry and business in itself. Approximately 750 billion dollars was spent in 1971 on pollution control equipment.

The Xerox Corp. annually gives leaves of absence at full pay and benefits for employees with special abilities to work in social services and research on social problems. RCA gives annual awards to plants who contribute the most for environmental protection in their own community. This is noteworthy, because plants which manufacture electronic components are not considered to be contributing elements to pollution; they are regarded as "clean" plants.

WOOD

Environmental problems in the woods and wood products industry center around three areas: air, water, and forests. The first major problem is the reduction of particulate matter in exhausts into the air. For example, sawdust was previously considered a waste product and was frequently burned. This sawdust is now used for several types of new products, such as compressed sawdust logs for use in fireplaces and for reduction chemically into paper products. Where it is still burned, the heat from the burning is used to provide energy to run the plant itself. When burned, the particulate solids are removed from the smoke and reclaimed. The recovered carbon particles from the smoke are used in filters or may be processed and sold as charcoal briquettes.

Particulates are being removed from air by three processes: "scrubbers" which wash the particles from the air, "precipitators" which electronically remove the particles from the air, and large "filters." In filters, the air is forced through tiny holes which allow the air to escape but which trap the particles.

However, another problem remains in cleaning the air, and that is dealing with odors. Both the Weyerhauser Corp. and Potlatch Forest use vaposheres to condense the odorous and corrosive gases into distillates and to recycle these distillates back into the manufacturing process.

The second major area of pollution in woodworking industries is water pollution. Holding ponds are used to soak and soften logs before they are sliced into plywood. Water is used for cooling factories and machinery and to flush away residual wastes from papermaking. Special holding ponds are now used to soak logs so that solids and chemicals do not drain into regular watershed areas. Coolant waters are being recycled and are not discharged into rivers and streams after they have been used and contaminated, and the residues from the papermaking process are now recycled back into the papermaking process as much as possible. The remaining residue is put through a process where the residues are made environmentally safe before they are discharged. This process required clarifiers, an aeration basin, and a holding pond where the effluent is purified before discharging. This process is similar to the process used in the treatment of raw sewage from cities and towns. The Westvaco Paper Co. recently guaranteed the financing for treating the combined wastes from its papermaking mill and the sewage from nearby communities in the state of Maryland.

The third area for environmental control in the wood products industries is the proper management of our forests. Improper harvesting can ruin the watersheds, cause erosion, reduce rainfall, and deplete our forest supply. Proper management can prevent these. Several large forest industries report that they can grow more trees than they cut and not disarrange the watershed cycle. The Scott Paper Co. typifies this position of the forest industries by stating, "The continual regeneration of our woodland resources is essential to the existence of our business, and it is on this basis that we manage them."

METAL

In the metal industries, problems exist in acquiring the raw materials, in processing the materials for use, and in the making of the final product. Strip mining, an economical method of mining, has been heavily criticized because it removes vegetation and leaves gaping holes. However, new strip mining techniques have enabled mining companies to remove fertile top soil and vegetation and store it while the minerals are being removed for use. After the minerals are removed, inert landfill materials are used to fill the holes and the cover vegetation is replaced. The inert landfill is now being made from municipal garbage and wastes.

The metals industry has also been a contributor to the pollution of air and water. The steel industry, with marginal profits, is reported to have already spent 500 million dollars on environmental controls in the last five years. However, in order to completely modernize, it faces an additional expense of two billion dollars within the next five years. The Republic Steel Corp. reports that it has spent over 36 million dollars over the past two years to combat air and water pollution in New York, Pennsylvania, and Ohio.

To produce steel, coal must be baked to form coke. The baking process emits toxic gases. The coke is also later burned as fuel, which gives off other toxic gases. These gases include iron oxide, fly ash, and sulphur-oxygen compounds. The sulphur-oxygen compounds can combine with water to form sulphuric acid, which is harmful to all forms of life. Precipitators are being successfully used to reduce particulates from the smoke.

Great quantities of water are used to form the steel into usable pieces. In Cleveland, Republic Steel is constructing a waste water treatment plant. This facility will treat the waste water used to quench the coke and to cool the steel during the forming stages so that no pollutant materials are used or contained in the discharges into the near-by rivers. Nine million dollars was also spent to increase the flow rate of the Buffalo River near

Buffalo, New York, so that natural and man-made waste materials will not build up and choke the river bed. Five million dollars was spent to construct cooling towers for an electric furnace system so that the water could be recycled and not discharged directly into near-by rivers or streams. Other types of action include reclaiming units to recover, regenerate, and reuse the hydrochloric acid used in cleaning steel products so that no acids will be discharged into public waterways.

ELECTRONICS

Electronics is playing its role in the control of man's environment as well. Electronic devices are used to precipitate solid particles from the air, and electronic sensing and metering devices are used in the construction of control equipment and automatic waste treatment devices. However, most electronic manufacturers are "clean" in that the manufacturing processes are not considered great polluting problems.

The greatest polluting factor in electronics is the generation of electrical power itself. Most electrical generating plants in this country operate steam turbines to run the generators. However, the steam is generated by burning fossil fuels such as coal, fuel oil, or natural gas. These fuels, the same as the fuels used in the steel industry, emit smoke from solid particles and the sulphur-oxygen compounds when they are burned.

Power companies have developed a new coal-refining process to help eliminate the problems from these smoke emissions. The coal, which is the most abundant basic fuel, is refined by grinding it, dissolving it, filtering out the ash and sulfur, and reconstituting the coal in the form of either a hot liquid or solid pellets. The refined fuel is far superior to raw coal in heating efficiency, and it burns much cleaner. Several major oil companies have also developed processes to remove the sulphur from crude oil before it is refined. However, these are not ultimate solutions because the world's supply of fossil fuel is not infinite. New methods must be found to generate electrical power.

Nuclear plants are being developed to generate electricity. It would appear that the saving of the fossil fuels normally burned to make steam to operate the generators is substantial—and it is. However, an unknown factor developed when scientists found that plants require large amounts of water for cooling the nuclear reactor. The heated water was discharged into streams and rivers and caused great changes in the suitability of these streams for fish and plant life.

Westinghouse is working on improved versions of these nuclear reactors. However, it has also developed an experimental fast-breeder reactor that does not require great amounts of water. Fusion of atomic materials rather than present fission processes would produce less heat and chemical pollution. Fusion is in a basic experimental stage and will not be operationally developed for some period of time, perhaps not before the turn of the century. However, it appears to be the ultimate source of power by today's standards. Almost any material may be used as fuel in the fusion process, which converts matter directly into energy. Thus, common sea water would provide an almost inexhaustable supply of atomic fuel for fusion processes.

Another experimental generating process requires the use of plasma. Plasma is the almost "pure energy" fourth state of matter. One process involves passing plasma through a magnetic field to generate the electricity. The plasma must be heated to some 5,000 degrees Fahrenheit, however, and gives off large quantities of nitrogen-oxygen compounds which are very harmful in the same fashion as the sulphur-oxygen compounds.

A second plasma process may ultimately derive more power, but requires temperatures of over 16,000,000 degrees Centigrade. The only experimental process which can contain the plasma at these temperatures is by suspending the plasma within magnetic fields. However, these great temperatures and magnetic fields make it only a "theoretical" possibility to tap off efficient generated electrical energy.

TRANSPORTATION

Transportation is also a source of pollution. You may recall the controversy generated by the SST project. Scientists first brought many of our environmental problems to the attention of the world by the "hot house effect" theory based upon covering much of the world's surface with vapor trails from jet airplanes. However, it is still not known for certain if these conditions would have a cooling or a heating effect upon the world's climate.

However, the main pollutant is the exhaust emission from internal combustion engines. The emissions from these engines produce lead, various oxides, nitrides, and other noxious and harmful compounds. Two other forms of pollution associated with transportation include noise and scrap automobile bodies.

Steadily increasing traffic volume coupled with the spread of urban areas has made the need imperative for public transportation facilities capable of handling masses of people. Individual transportation, such as private automobiles and airplanes, is becoming both increasingly hazardous and a greater pollutant source. The transit system being developed for the Bay Area of San Francisco is one example of the public transportation systems being developed. Developments in this system include Westinghouse-designed, computer-controlled, rubber-tired, electric cars moving on tracks. Similar transit systems are planned or in use in Tampa, Pittsburgh, New York, and Boston.

Noise comes from traffic, industrial machines, service trucks, lawn mowers, chain saws, factories, and many other sources. It is known that with an increase in population density, an increase in the level of sound occurs, and that intense sound levels have adverse health effects. Noise abatement and control features the use of mufflers, the use of rubber tires for railroad and similar equipment, and the use of electric motors in as many sources as possible instead of the internal combustion type of engine. Other types of noise abatement in transportation include the use of baffles around airport and highway systems to break up intense sound waves generated by loud noises.

RECYCLING

Recycling and recovery processes hold great hope for solving many problems. The recovery of waste products includes the salvage of metal and glass from garbage, and the use of combustible garbage such as coffee grounds, paper, and similar materials for fuel. Other recycling processes include the recycling of paper products into new paper and products, and the recycling of sewage and industrial effluents into drinkable water. Drinking water alone becomes a problem for large urban areas.

One garbage re-use system developed by Monsanto separates metal from garbage and converts the garbage into inert landfill materials. Another new process is the hydrapulping process which takes garbage, mixes it with water, and by settling and centrifugal force separates metals, glass, and other solids. The remaining liquid mixtures are processed to recover usable wood fibers from paper products. The system used by the St. Regis Paper Co. can recover up to half the paper in the garbage.

SPECIAL PROBLEMS

The problem of reworking old factories to meet modern standards is seldom economically feasible in any industry. The old plants, many of which date back to the mid-1800's, were built at a time when there was little concern for environmental controls. Vast areas were unsettled, unpopulated, and unused, and nature was still able to cover up the misuse of man. However, as the nation expanded, population grew, and industrial output increased, this ability of nature to replenish itself was diminished.

The old plants pose sociological problems as well. Communities, towns, and even cities have grown around the plants so that eliminating older plants can increase the social problems of unemployment, increased crime rates, slums, and low school income. These same communities contribute to pollution themselves.

The lack of information and knowledge about pollution and pollution controls is particularly distressing. Little is known about our environmental cycles. An example of this has been posed in the recent problem with phosphate detergents. Initially, detergent manufacturers were ordered to stop production of detergents with high phosphate content. However, other substances then used in the detergent manufacture were more directly harmful to people than the effects of the phosphates were harmful to the environment.

Another example of lack of knowledge is in the construction of lakes for generation of electricity and for flood control. At first appearance, the increased storage of water appears good. However, few people stop to realize the weight of the water in a lake upon the geographical structure of the earth's crust. It has been found that the increased weight of almost all lakes results in resettling of the earth's crust in the form of earthquakes. Unknown factors relating to jet airplanes and nuclear generators have already been mentioned.

THE ROLE OF INDUSTRIAL ARTS

The role of industrial arts in the primary and secondary schools consists of two major functions: developing positive attitudes about pollution control and presenting background information as common knowledge so that people may be effective consumers and users of our resources. The development of these attitudes and concepts is part of the role of a school in the society.

A favorable attitude toward the proper utilization of our environment is necessary for people in all walks of life, whether they are engineers, scientists, equipment operators, plant managers, housewives, or engage in other occupations. Further, the attitudes of today's students will form the basic philosophy about social responsibilities for tomorrow's leaders in government and industry. Their attitudes will determine their receptiveness to including environmental controls as a part of industrial processes and in the consumption of industrial products.

Broad general concepts of problems and processes also serve to help orient students for careers in pollution control and environmental technology. The White House predicts more than a two-fold increase in the need for ecological workers by 1980. For this field to increase to over 1.2 million workers, labor shortages in environmental careers will occur.

There are two basic approaches for including the environmental studies in industrial education classes. The first is to include environmental subjects as related information in traditional unit (or subject matter) shops and laboratories. For example, a woodworking class might study the problems and processes in environmental control as they relate to the woodworking industries.

The second approach is to include environmental technology as a separate field to study. In this approach, environmental control would include units on air pollution, water pollution, ecological planning, land reclamation and utilization, recycling and reprocessing products, waste disposal techniques, and techniques for investigating both pollution sources and methods of ending pollution. This approach would not relate pollution to a specific area such as metals or woods, but would relate pollution factors to types of pollution such as air, water, resources, noise, and so forth. Each unit would be multidisciplinary in scope and could easily relate to both physical and life sciences.

In either case, certain ideas remain as key elements. First, industrial arts h[illegible] always been interesting to students because of its "hands-on" approach. Secondly, w[illegible] the topic of our environment is not unique, some unique aspects should be cove[illegible] industrial arts that do not duplicate topics covered in science or other subjects.

For example, a woodworking class might develop ways of using its own waste products such as short pieces and sawdust. Sawdust could be combined with bonding agents and molded into products. Small mass production projects may be developed from small wooden pieces.

Other ideas would include studying the effects of wood wastes on water, the effects of polluted water on seedling tree growth, and experiments in paper making using old newspapers and such.

Activities appropriate for industrial arts laboratories would include making and testing devices to detect temperature changes, light penetration (for testing clearness) in both air and water, changes in acidity or salinity of water, photography for detection—particularly through use of infrared spectrum, experiments in recycling, redesign of products and efficient use of raw materials, and the testing of industrial products.

Ideas will have to be developed and shared.

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Educational Psychology

Creative Learning Environments: Some Contributing Factors

John M. Shemick

We have been hearing a great deal about environment these days. For the purposes of this discussion, let us define environment as "the aggregate of all external conditions and influences affecting the life and development of an organism;" not just temperature, light, and ventilation. In analyzing what might be the factors in the aggregate of all external conditions which might influence creative learning, at least four major ones come to mind; namely, physical, human, managerial, and instructional factors.

PHYSICAL FACTORS

Flexibility

First, let's look at the physical factors influencing a creative environment. Although modern schools tend to provide more opportunity for flexibility, an important component of a creative environment, it was not always true. For example, when John Dewey was organizing his experimental school in Chicago in the 1890's, he searched for appropriate furniture to supply the kind of environment he desired for an active working class. A perceptive salesman is said to have told him that he was seeking equipment that encouraged working, while all conventional school furniture was designed to encourage listening.[4]

Availability

These days we often hear about individualized learning and independent study. What sort of physical environment is necessary to carry out and/or encourage such student activity? Not too long ago, I recall that when an industrial arts supervisor was evaluating the use of some 8mm film-loop projectors purchased by the school district, he saw very few in use. In due course he asked a teacher why the students made so little use of the projectors. The teacher replied, "Search me—all they have to do is ask for one and I will get it out for them." As you know, the unique value of the film-loop projector is its ready availability to students. However, the teacher's desire to protect his new equipment actually made it less available to students which, in the end, was counter productive to promoting independent study.

Attitudes

Robert Campbell,[3] in his doctoral dissertation study of pupil attitude toward industrial arts, found that despite very modest and even threadbare physical conditions of some laboratories, students were still very interested in industrial arts. In contrast, from my experience as a visiting supervisor, I have noticed that student morale was low when their laboratory equipment was not operative. In retrospect, I believe that in the first case, although the students saw little equipment, they could also see that the teacher was doing the best he could for them; in the second case, the students felt that the use of equipment was being denied them because of the ineffectiveness of their teacher.

How extensive need the physical environment be to promote creative behavior? While some sort of minimum core of facilities is necessary, the instructor who constantly laments because he does not have that special piece of equipment which would make his work "so much easier" would seem to me to be promoting the "alibi Ike" attitude. Our literature is replete with articles describing unique solutions in overcoming the lack of special facilities. This, it would seem, represents problem solving and "creativity," if you will, of the highest order. In the final analysis then, although flexibility and availability are important, creating a creative environment falls heavily on the teacher and how well he interacts with his students. Let's focus now on the human factors in the creativity equation.

HUMAN FACTORS

Schutz's Model

Perhaps the most useful theoretical model that I have encountered recently, which helps me in answering some of those unanswered questions that have been lurking in my professional subconsciousness, is Schutz's Three-Dimensional Theory of Interpersonal

Relations.[13] This theory holds that all interpersonal relations can be described in terms of inclusion, control, or affection behavior. According to Schutz, behaviors in these three areas of interpersonal relations can be further typed into three general patterns: over or excessive behavior, ideal behavior, and under or deficient behavior. The model incorporates each of these types of behavior with relevance to teacher and students. Let's take a closer look at each of Schutz's types.

SCHUTZ'S THEORY OF GENERAL BEHAVIOR PATTERNS

Inclusion Types	Over-social behavior:	A person who cannot function well by himself due to an excessive need to be with other people.
	Social (Ideal) behavior:	A person who is comfortable with others but who can be independent of others when necessary.
	Under-social behavior:	A person who avoids contact and interactions with others—a recluse.
Control Types	Autocratic behavior:	A person who, to an excessive degree, seeks to dominate the behaviors of others.
	Democratic (Ideal) behavior:	A person who can either lead and control or who can take directions from others and follow them as need be.
	Abdicratic behavior:	A person who avoids dominating others and is happiest with others in control.
Affection Types	Over-personal behavior:	A person who is too close and personal in his relations with others, a smothering type of personality.
	Personal (Ideal) behavior:	A person who can be comfortable in close and personal situations, but who can also function without such relationships.
	Under-personal behavior:	A person who is incapable of warm, close, and personal behaviors toward others and who does not desire to receive such behaviors.

Inclusion Behavior

In the Inclusion category, being overly-social in the case of a teacher means that he is unable to maintain the appropriate social distance required of him as a teacher. Such a teacher will find that his students fail to respect him as an adult because of his concern with being a buddy or a pal to his students; he does not demand and secure the order required for effective teaching. At the other end of the continuum, the teacher who remains aloof from his students typifies under-social behavior, and a wall develops between him and his students. Such a teacher, who avoids personal interaction with his students in and out of class, may cause hostile behaviors in his students because they feel alienated by the teacher's distance.

Another aspect of the inclusion factor is that of matching teacher needs and behavior with that of his students. For example, an under-social teacher might find instructing a group of youngsters with high needs for inclusion a very frustrating experience. This can arise when significant numbers of students in a class are from broken homes or single-parent families, as is the case with many disadvantaged students. It is even possible that the teacher's inclusion-behavior may influence his choice of learning experiences for his class. Typically, the under-social teacher chooses fewer learning activities which require him to interact with his students in group or team work. This may answer, at least in part, why a particular teaching strategy may be successful for one teacher, but not nearly so with another teacher.

Control

Control as a category in the model provides an explanation for the type of class organization one finds in a laboratory. An autocratic teacher is usually less willing to employ teaching strategies that involve disagreement, debate, or the questioning of expert authorities. Such strategies are an integral part of problem solving, critical thinking, and other creative activities.

Affection

Affection is often the cause for teachers' failing to establish the order necessary for effective instruction to take pl ce. Typically, teachers who need to be loved by their students permit almost anyt long as their students offer gestures of affection. On the other hand, teachers e of close and warm relationships create problems for themselves because stude v them as cold and impersonal. Both forms of extreme affection are counter pro because they produce conduct that blocks effective learning. Perhaps the best rule the thumb is that if a teacher is to be an effective agent in the learning process, he should eek to gain the respect of his students before he seeks popularity or affection.

Peer Pressure

Perhaps a word should be said about recognizing the popularity structure among the students of a class. Redl[13] has noted that classes of students tend to establish dominance systems or pecking orders. He contends that at least some behavior problems are the product of the teacher's violation of that order. For example, when a boy who enjoys a high status with his group is overlooked or ignored by the teacher in assigning jobs in the laboratory personnel plan, malbehavior can result. The pecking order can also affect the interaction the teacher might have with any student in his class because the student may have to react according to the code of the group.

MANAGERIAL FACTORS

Advanced Organizer

How a teacher organizes and structures the operation of his classroom-laboratory affects the performance of his students. Ausubel[1] found that when students were provided an overview, an advance organizer, to instructional content before it was presented, they learned much more than when they were not so provided. This is consistent with the successful whole-then-part approach to teaching reported by Palmer in Cronbach.[5] Johnson and Johnson[9] have incorporated this concept into their procedures for organizing Learning Activity Packages (LAPS). They have refined Ausubel's idea into three parts, namely, 1) Advance Organizer "...provides the learner with a cognitive structure or set...," 2) Perceived Purpose "...helps the learner to perceive the importance of the instruction to follow," and 3) Elicitors "...a series of questions or statements designed to produce intended learner responses... which lead to the response specified in the objective."

Webster's Phases

Opening Phase

The advance organizer idea relates well with Webster's[13] three phases of classroom instruction routine. The first of these is the Opening Phase of class which is quite critical because, "A poorly structured start to class period or learning activity can destroy all that a teacher tries to do during the other two phases."

Instructional Phase

The second phase or Main Instructional Phase should encompass an operational routine that provides a framework within which students can operate. Most of the research shows that while a rigid inflexible type class structure stiffles creativity, no structure or complete permissiveness results in non-productive activity.

Instructional goals are necessary whether established by the teacher, the group, or as a joint effort between students and teacher. Lockette,[10] in his study on aspirational level, demonstrated that realistic goals result in higher levels of achievement in the long run than do the short-lived successes which result from unrealistic goals.

Closing Phase

The third or Closing Phase, according to Webster, is just as important as the Opening Phase of the instructional period. Obviously, this is where an effective pupil-personnel laboratory organization can play an important part. Here again, the organization should stimulate intrinsic motivation rather than an autocratic "by the numbers" type of organization.

INSTRUCTIONAL FACTORS

Developmental Level

When one reviews the research in our field, there are seemingly contradictory results coming out of the studies reported. For example, London[11] found that with 7th graders job sheets were better, in terms of achievement, than operation sheets. Avery[2] found, with 7th graders again, that process models were better than operation sheets. Fowler[6] found, with college students, that operation sheets were better than process models. This may appear confusing, until one notices the difference in the ages of the subjects used in the studies. From what we know about developmental psychology, with younger students the more concrete process model would be more effective than the more abstract mode of printed instructions. On the other hand, college students have been admitted to college, to a large degree, upon their comprehension of the written word; therefore, written instruction, in the form of operation sheets, might logically be most appropriate for them. However, the process model implies uniform student activities or a fairly rigidly structured instructional program.

Motivation

According to Jack Frymier,[8] "The amount of structure in a classroom should vary directly with the degree of student motivation; the higher the movitation, the less the structure." He goes on to say, "Motivations are closer to learning even than ability, as far as teaching methods are concerned." Frymier reflects Schutz's Theory of General Behavior Pattern when he says: "Teachers must be fitted to students whose motivational levels demand the kind of teaching style which is most appropriate for them. Many teachers feel more at ease using one kind of structure than another.... The best teachers are those who are most flexible, most able to build a structure which corresponds to their students' needs."

Physical Maturation Level

In terms of maturation, John Fuzak[7] carried out a study to determine what part physical maturation plays in success or failure in industrial arts. After employing a number of manipulative tests, the only one that was shown significant was strength of grip. A student with gripping power below 24 kilograms (approx. 53 lbs.) was unable to carry out the typical activities found in industrial arts laboratories and required special attention. An interesting correlate to this finding was that quite often below average strength-of-grip students were somewhat chronologically younger than their classmates; although they were intellectually equal to their classmates, physically they were not equal. In contrast, students who had been held back a grade because of academic reasons were physically much more advanced and enjoyed greater success in industrial arts. The net result was that the myth that the academically talented cannot succeed in industrial arts continues to be perpetuated.

Individualizing Instruction

Perhaps one of the most promising educational innovations upon which we should focus our attention is that of the Continuous Progress Program of individualized instruction.[12] Unlike the old instruction sheets which provided instruction to individuals on a self-paced basis, individualized instruction attempts to adjust the instructional process and sequance to the learner. The Learning Activity Package is probably the form being used the most currently.

Perhaps what is unique about the Continuous Progress concept is that each learning unit, or package, must be mastered before proceeding to the next in the sequence. And too, if the learning activity package pre-test indicates that the student has already mastered the objectives of the package, he may move on and by-pass that package. He ultimately may by-pass any number of learning units or packages. On the other hand, he may have to work through a given package or unit several times before he can move on to the next one.

Secondly, the student may choose the mode of instruction, within the package, that best fits his learning style. Of course, this requires an enormous amount of planning and preparation on the part of the teacher. However, if well done, the teacher's investment in time and energy should pay great dividends in the satisfaction of seeing his students go farther and faster than ever before.

SUMMARY

In terms of physical factors, the teacher should strive for flexibility and availability of facilities, and should display a positive attitude toward them before his students. Second was the human factor of interpersonal relations, wherein the teacher might well analyze himself and his students in terms of Schutz's theoretical model. Class management and organization constituted the third factor in which the aspects of knowledge of purpose and realistic goals were related to the three phases of class operations. Finally, the instructional factors of developmental level, motivation, and physical maturation were discussed with the idea that the Continuous Progress Program of individualized instruction may possess the answer to meeting the challenge.

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Creativity, Definition and Theory

T. B. Young

Creativity is one of the basic objectives of industrial arts, if this quality of the individual is considered as a talent which may be discovered and developed. If we consider the consequence, it is possible that this is the most important single goal of the industrial arts program. Those who contribute most to progress are generally classified as "creative" individuals. It is not enough, however, to claim to contribute to the development of creativity in the individual unless we can identify those who are gifted in this respect. Further, it is useless to identify these unless there is sufficient knowledge of the operational theory of the creative act to provide guidance to those who propose to promote creativity.

It is the purpose of this paper to provide some insight into the theories which have to do with creativity and to provide some guidance to the identification of those who are creative.

DEFINITION

Creativity has been defined in several ways which depend primarily upon the viewpoint of the definer. First, creativity has been defined in terms of the product. The product (of the creative act) must be novel and useful; i.e., an idea which is rare or infrequent but is sustained to fruition. Some of the definers define the utility of the object with respect to the individual, while others insist that the product must be useful to society.

Secondly, creativity can be defined as an underlying process. The process is divergent, yet fruitful. Even though this definition places the focus on the act as the creative element, it does not materially alter the identification of the creative person.

Thirdly, creativity may be defined as an experience. This experience is inspired and immanent; i.e., the basic issue is not the "inspired product" but the "inspired moment."

Fourthly, creativity has been defined by Torrance as:

> the process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on: identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them; and finally, communicating the result.

THEORY

While the definitions seem to agree to the extent that novelty with utility, unconventional thinking, high motivation, and a certain amount of vagueness or ambiguity is involved in creativity, the theories of how creativity operates in the human mind have more variety. Perhaps the most familiar theory to industrial arts personnel is based upon the rational approach stated by John Dewey in his logical steps in thinking. (A felt difficulty, its definition, suggestion toward a solution, reasoning of its bearing toward the solution, and observation and experiment leading to its acceptance or rejection). The adaptation of these steps as an organizational pattern not only for thinking, but as a pattern for many types of logical presentations is evident throughout the literature of education and the technologies. However, if later theories are considered, there remains considerable doubt as to the completeness of this approach to understanding creative mental processes. If the means by which hypotheses are formed follows later theories, it may be inferred that Dewey's five steps constitute a pattern which has considerable consistency with other theories.

Thorndyke considered creativity as an act of association and that a novel solution arises as a function of the rearrangement of the associative elements drawn from past experience. Wertheimer considers this and Dewey's theory as an inadequate explanation. He sees creativity as a reorganization of the gestalten resulting from the strains created by the problem situation. While this takes a different psychological base, it is somewhat comparable to Dewey's "felt need."

The foregoing theories are concerned more with problem solving than with those derived from "the divergent act" as a function of the subconscious mind, and apply principally to the conscious or rational mind. Theories derived from psychoanalysis ascribe a vital role to the conscious in the development of the divergent or the intuitional act associated with creativity. The act of insight is considered as arising in the unconscious, or primary process, and to be developed in the ego-controlled, or secondary process of the mind. The facility for the creativity is made functional as ego control can be prevented from interfering with regression to the primary or unconscious process. Those who are not able to regress are rigid in their thinking, since their thought process is controlled by preconceived ideas of reality. The unconscious mind is thought to be able to deal with a great deal more confusion and ambiguity than the conscious mind. As a consequence, combinations are possible at this level which are virtually impossible for the conscious mind. Under this theory, those who can call into action the unconscious are creative thinkers; those who cannot are not creative. This theory may explain the experience of those who awaken with the key to the solution of a problem or those who have a sudden flash of insight when they are not concerned consciously with the problem solution, since in these states the defense of the ego is less active. It has also been postulated that the "flash of insight" or the "eurekaphenomenon" arises in the unconscious and is allowed to come to the level of consciousness without detail of refinement. It then becomes the function of the secondary processes to test and refine the original key to determine whether the unconscious has provided a true or a false clue to the solution of the problem.

Some of the research indicates that creativity is further conditioned by intelligence. This does not imply that there is a correlation between intelligence and creativity, but rather that there is a point in intelligence where a high degree of creativity seems to become possible or operative. Above this threshold level there is little or no increase in creativity as measured by presently available tests. The threshold suggested by research is at about 120 I.Q.

If these theories are compared to the observed characteristics of those who can be identified as creative, it appears that the theories from depth psychology provide certain insights as to the nature of the deviant response while those from rational logic are the tools for refining, extending, and testing the intuitional. Taking the definition of Torrence seems to avoid the problems encountered in theories from depth psychology in that sensitivities appear to be in the conscious or rational rather than in the subconscious.

THEORETICAL IMPLICATIONS

The definition we accept determines both the number of students who may be considered creative and the approach used in development of these abilities. If the rational definitions are accepted, it follows that all who have the power of reasoning may be considered as creative. However, if we accept the idea that creativity is a function of the subconscious and the accompanying I.Q. theory, the number is reduced considerably, and the practices which can be used to promote growth in creativity become very difficult to define. This may have broad implications for industrial arts educators, in that in situations where assignment of students is often from the non-college-bound group, there would be very few students who could meet the threshold level and yet fewer who could meet the criterion conditions of being creative. It is conceivable that those who might be expected to fall within this group under these conditions would possibly consist of less than 1% of this population. Where industrial arts is required, the percentage would be expected to be 2% or less. In the typical school situation which is based upon conformity, it is highly probable that the average teacher will be able to identify very few of his students as being creative since they will have been conditioned to conformity rather than to being divergent in action.

Even though the expectations are rather poor that industrial arts classes will contain many of those identified as highly creative, it is possible that creativity may exist in degree and that there are those with sufficient ability to profit from an environment conducive to the development of the degree of creativity which does exist. It also may be postulated that creativity may exist which cannot be positively identified because of the lack of more refined techniques.

If the theories which are based upon the logical thinking pattern are accepted, there appears to be a much higher potential for developing appropriate techniques to enhance the power of creativity through practice and attitudinal changes in the individual. The population will also be such that a significant proportion of those in industrial arts classes may be able to participate in the more creative processes. The probable proportion would be about two-thirds if the subject is required and about one-third if assigned from the non-college group. Under this theoretical base, the values to be realized in providing for the development of creative talent are far greater than those possible under the depth psychology theories, in that the population would be much larger.

Since industrial arts personnel generally are not professionals in the area of testing, it is perhaps more appropriate to omit testing techniques as a basic means of identifying the creative individual. There are certain observable characteristics which may serve as guides to identification. These are parts of a profile description, and certain elements may appear in degree or even not at all in certain cases. The greater the presence of these elements of the profile, the greater is the assurance that creativity exists. However, absence of one or more of the observable traits does not eliminate the possibility that the individual does possess the general faculty for creativity.

The following list of traits is stated by Marshall Hahn: The creative individual is thought to be acceptive of disorder, adventurous, always baffled by something, defiant of conventions of health, disruptive of organization, energetic, full of curiosity, independent in thinking and judgment, intuitive and original, odd in habits, persistent, self assertive, self confident, not interested in small details, and stubborn.

It is worth noting that this list contains many of the same phrases which are used to describe the problem child in the school. It is highly possible that our present insistence upon conformity for the sake of group instruction is the most wasteful practice possible for the development of the creative individual to his highest potential.

SUMMARY

To summarize, it appears that creativity differs in both definition and in theory. The approach to creativity depends upon the choice of definition, in that both population and educational practice depend upon the choices. The logical-conscious base yields a larger population and a more realizable set of goals. The theories based in depth psychology yield a very meager population and present problems in both research and educational practice. Analysis of the characteristics of those who have been identified as creative provides a base by which others with creative characteristics can be identified.

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Every Student Is Important

Rollin Williams III

Recently the parents of a girl in college received a letter; it went something like this:

Dear Mom and Dad,

I thought I should write before you receive the bill from the hospital so you will not be too alarmed. Let me say first that I did manage to escape with only minor bums and a few fractures when my dormitory burned to the ground last week. And having nowhere to live, I know you will understand why I am now rooming with this very attractive and interesting student who so generously offered his quarters to me. While he is not exactly a Communist (I'd call him more of a practicing Marxist) and is from one of the more rebellious and underdeveloped nations, I know you won't be too bothered about these facts, remembering those perfectly splendid liberal views of yours on politics and human relations. Yet I must face the possibility that it may upset you to hear that by the time I come home for the holidays I will have become a mother.

Love,

Betsy

P.S. None of these things happened, but I did get a "D" minus in Political Science and I flunked Math. I just wanted you to get these grades in proper perspective.

Let's attempt to get our educational concepts in proper perspective.

1. Why are we in teaching?
2. Are we dedicated to our profession?
3. What are our goals in life?
4. What are we doing with our lives?
5. What can we do to improve our industrial arts teaching?

Now let us discuss industrial arts, dedication, and teaching. Several months ago, I found a large Ry-Crisp box that contained some rather personal letters written during the two-year period I was in the service. Also thrown in the box were some letters from individuals received while I was doing graduate study in industrial arts. A number of the letters were from my grandparents telling of their years as educational missionaries in China.

As I read the letters, I thought of a story my grandfather told me. One year there was a great famine in the northern part of China. A number of Chinese would stop by the compound gate as they came down from the north to ask for food. Among this group was a couple. Grandfather was impressed with them, and when they asked for work he indicated the need for a gatekeeper. This man and his wife lived in the compound area where he served as gatekeeper for a number of years.

In the late 1920's, groups of soldier bandits were common in this particular area of China. During one period they would come to the compound and demand money by saying, "Your money or your life." When one group came, Grandfather told them that he was sorry but he had given all the money he had to the group that had just left. The soldiers put him up against the wall and prepared to execute him by firing squad. Just as they were ready to shoot, the gatekeeper placed himself in front of Grandfather and yelled to his wife to get their savings. His wife went immediately to their bed, cut open the mattress, and removed what little money they had saved over the past four years. She gave this money to the soldiers and they released my Grandfather, who was placed in a cistern by the gatekeeper and his wife. He hid there for several days. I thought of this gatekeeper, and I thought about dedication.

These letters expressed the joy of teaching and the loneliness of being separated for long periods of time. The letters told of Grandfather's teaching in a small Christian college during the twilight years of his life and collecting material for a book he was writing.

The box also contained several letters from former teachers. I thought of their influence on me in my vocation and philosophy of life.

As I thought of those teachers, I remembered one with whom I had come in contact, Art Combs, at the University of Florida. He told a story one day which was relayed to him by an elementary supervisor. The supervisor stated that school had just started, and on the third day she was waiting in the hall. Suddenly, she saw a small boy who was crying. The supervisor asked him what was the matter. The child couldn't find his teacher.

His teacher, by the way, was a young first grade teacher who normally wore her hair in a long pony tail that went half-way down her back. On that particular day the teacher, as young teachers many times do, rolled her hair up and put it on top of her head. Little Johnny walked into his classroom, but didn't recognize his teacher. He went out into the hall trying to find where he was supposed to be. The supervisor found him and said, "I'll help you, Johnny: let's see if we can find your teacher. What's your teacher's name?"

Johnny said, "I don't know."

Then she asked, "What is your room number?"

Johnny replied, "I don't know.'

She asked what grade he was in and he replied, "The first grade." So she went down the hall to one first grade class, knocked at the door, looked in, and Johnny said, "No, that is not my teacher." They went to the next first grade class. He looked in and said, "No, this is not my teacher." Finally, they opened the door to the next room and he saw his teacher. She said, "Oh, Johnny! We have missed you so. We wondered if something had happened to you, if you were sick, we just didn't know where you were. We're so glad you are here with us now."

The supervisor observed this incident and later talked about it with Dr. Combs. The first grade teacher could have said, if she were supervisor-oriented, "Oh, Miss Johnson, please sit down, we are so glad to have you visit our class." If she were overly concerned with the supervisor, she would have emphasized the supervisor. Or if she had been concerned with discipline, then she would have said, "My goodness, Johnny, you're late. You know you are supposed to go to the office and pick up a pass. Don't ever do that again. You will have to stay after school five or ten minutes because you're late." Or if the teacher were subject matter oriented, she would have said, "My goodness, where have you been, Johnny, we have been studying words for 10 minutes and you have missed the most important part. I don't know how you are going to learn anything about words if you don't come to class on time." No, the teacher, Dr. Combs went on, didn't say this; you see, she knew what really was important—little boys are important.

The old Ry-Crisp box also produced a number of letters written to my wife while I was in the Navy. As I read those letters that had been written a number of years ago, I discovered several things concerning one's life work. One letter told of the Destroyer SULLIVANS which we replenished while at sea. I had written of how it was named after five brothers who went down on the ship during World War II.

In another letter, I told my wife about a Destroyer we replenished that was named KENNEDY after the brother of the junior senator from Massachusetts, John Kennedy. Another senator from New York, Robert Kennedy, served on this ship. I thought of the deaths of these two men and of dedication.

One letter was from an industrial arts teacher in New Jersey who told me about a problem-solving approach he used in his industrial arts class in the elementary school. He said, "Recently a boy came to me holding a two-pound coffee can and said, 'I want to build a mechanical robot.' He explained that his elementary classroom teacher thought it was too much for him. She couldn't see how a coffee can plus a pound or so of metal, erector set gears, three or so magnetic motors, and several yards of wire could become a mechanical robot. Several weeks later, a robot swinging its aluminum arms walked out of the shop, blinked its eyes, turned right and left, backed up to avoid a menacing foot of a passerby, and laughed with its buzzer voice—all at the switch command of its beaming creator. My contribution was providing the time, materials, tool instruction, facilities, and very few early suggestions and encouragements. The product, including the cam action for the arms, was entirely the brainchild of this sixth grade boy."

In California, another teacher told me about a playhouse his junior high school group made. The teacher said, "I outlined the various jobs to be done in construction. The students took inventory of their particular abilities, and the class president made assignments for individual responsibilities. Some students decided to lay the linoleum, paint, decorate the interior, make curtains, and paper the walls. The more experienced carpenters in the group did the construction work. Others gathered materials such as lumber, nails, tools, shingles, and so forth. Several of the boys in the group were delighted to paint the exterior of the house. When the class completed the project in two months, they all went (including myself) on an enjoyable trip to Disneyland."

An industrial arts teacher in Shreveport, Louisiana, stated in his letter, "The students decided upon and designed a product to put on the market. They identified the economic principles involved, such as capital, natural resources, labor, and market. After the product was approved, management obtained workers and set up for mass assembly line production. The product was inspected as it came off the assembly line and was transferred for distribution. After the product was sold, the problem of what to do with the money was solved by the class."

In another letter from California, a junior high industrial arts teacher said he overheard the following remark: "My parents always hide the presents I make for them in the closet." The instructor went on to say, "This prompted me to make a series of very simple jigs and fixtures to be used in construction with some machines and hand tools. These jigs were designed to reduce to a minimum points of error and inaccuracy in a gift project. Several years of industrial experience helped me do this. The jigs upgraded a particular project to a point well beyond the ability level of the junior high students. We were careful to try to parallel industry. After we did this, I did not hear any more remarks about presents being hidden in closets."

One New York teacher wrote me about the unique feature of the elementary industrial arts program where he taught. He said that it was designed to aid, in addition to the primary functions, other special areas. The psychologists and the industrial arts consultant worked together in determining certain activities that would be beneficial to emotionally disturbed children. This association of areas went beyond just discussing problems. Several psychological activities were arranged and carried through to complete success. An example of one activity was the following: Boys with effeminate characteristics in various fourth and fifth grades were selected by the school psychologist to work with the industrial arts consultant in the shop. The aim was to see whether physical male type activities—sawing, hammering, cleaning up, and so forth—could be successfully transmitted to the students. Gradually, changes in mannerisms, gestures, language, and conversations in eight out of 11 children proved that this was an area of experience that should be further explored. The main point here is that there are probably untold numbers of areas in regard to psychological services that could be successfully explored in the industrial arts program.

A letter from a Bloomfield, New Jersey, teacher stated, "My class of mentally retarded pupils mass produced counting bars for classrooms in the school. The counting bars were made from plastic spools, wooden dowels, wooden beads, and coat hangers. The job was set up on an assembly line basis, with the instructor carefully supervising the activities. For example, the student who drew the pattern on the base was the layout man; the pupils who operated the sander or jigsaw were called operators. When it was necessary to smooth sharp edges, the classed referred to it as breaking off sharp edges. The counting bars were assembled instead of put together. The students who did the inspecting were called quality control men."

One general shop instructor in Clear Lake, Washington, stated, "While studying a unit on forests and forest products, my students made paper from pulp secured from a nearby mill. On the paper they printed linoleum block prints for book plates and Christmas cards. In some instances, the pulp was made from old rags or Kleenex.

In one letter that I wrote to my wife, I found the following statement: "I tell you, being in the service has made me want to make something of myself. I hope wherever we end up we will be doing something that will influence people. You must feel like you want to do some good. There are so many people who are just existing in their output."

At the time I was in service, my wife was a third grade teacher in a rather poor section of a town in Florida. She left this school in mid-year so that she could be with me while I was stationed ashore. The school shaped much of the community life in the area where it was located and was a dynamic influence. The following letters received after my wife left the school were also found in the box. I think they showed the joys and responsibilities of teaching. Maybe the letters also indicate something about dedication and kids.

This is a letter from an average fourth grade student:

Dear Teacher,

How is the cold weather? The weather is hot here. I have a calf. I want you to come back will you? I like the teacher we have. I have C on reading. I have C on language, I have D on spelling. I have C on handwriting. I have C on arithmetic. I have D on social studies. I have S on health and physical education. I made C on individual.

Your friend,

The parents of the child who wrote the next letter were very interested in the child, and my wife visited their home. It was a neat, clean home filled with love between parents and children.

Dear Mrs. Williams,

I hope you are felling well. Mrs Sanders had to leav us and now Mrs. Hill is ore teacher now. She is very nice like you. You are lots nicer ther her and I love you much. The teacher is naming all of us for instance like floor, who's is the one to pick up the poper. I'm the messinger and I had a terrable time and connie is door we can only be it a week and now I have to say good-by. I love you much.

Love,

Jane

p.s. I see Jane made a few errors but she is improving, came up in two of her subjects, and stayed the same in the rest. We have all been real well and enjoying beautiful warm weather. Got faint smell of orange blossoms the other day. Do hope you are well and enjoying your selves.

Lovingly,

Mrs. Jones

Another letter was received:

Dear Teacher,

I hope you fell well, I do, I paste the 5th grade. Joe has past to the third grade. Joyce my sister is going to be in the 1st grade, so there will be three of us in school. Mrs. Williams, I saved not to long ago. Joe was saved to. My Uncle and aunt were separated but their back together she is 16 and he is 22. When I got your letter I was so suprise that I almost forgot to open it. I might get a bedroom suit if I do I'll get two lamps, a bed, a dresser a chester drawers, and a book shelf at the head of my bed.

Sincerely,

Miss Mary Smith

This next letter, which means a lot to both of us, was from a handsome boy. He never wore shoes to school and was a very poor reader and student.

Dear Teacher,

I hope you like the snow up thair.
We're in the Swingingwheel Readers.
I am improving in some of my work.
Our teacher is Mrs. Hill.
I miss you very much.
I loves you.

Yours truely,

One of the letters I found in the box was written to my wife while she was with her students; it said:

Dear Teacher,

Your a nice Teacher and we all love you very much. We hope your birthday is the happiest you ever had. If we ever have provoked you we will try to do better. May be we have been bad and have gotten punished for it, but still we think you are the necest Teacher in the world.

Sincerely,

Your class

As I looked at that old Ry-Crisp box and held in my hand the program of this conference, I noted the conference topic was "Industrial Arts in a Changing Society." Then I thought of the questions that I asked:

Why are we in teaching?
Are we dedicated to our professions?
What are our goals in life?
What are we going to do with our lives?

What can we do to improve our industrial arts teaching as concerned with a changing society? Then I thought of my curriculum studies and a basic curriculum concept. The concept is that ultimate goals of education must point the way for the more specific immediate goals framed by the classroom teacher. Then my response to the statement, "Excellence in instruction in our changing society," is that old Ry-Crisp box. Maybe some of these letters indicate what a well-planned program should consist of. It boils down to this, an excellent program in industrial arts rests solely on the shoulders of the industrial arts teacher and his dedication to the profession.

As I looked at that Ry-Crisp box and the theme of this meeting, I thought of the unique objectives of industrial arts: study of industry, study of tools, materials, processes, and products of industry, and use of science and math to solve technical problems. These letters gave some indication of how some people are meeting these unique objectives.

What else should we do for youth to provide excellence in instruction? What other things did the letters indicate? Tool skills, avocational or hobby skills, and social development of the child. Maybe the letters indicated the teacher should show respect to the student, understanding, dedication, interest, concern, YES, and maybe even LOVE.

Next, I thought of a January 1971 speech before the National Association of Secondary

School Principals, made by Dr. Sidney P. Marland, Jr., United States Commissioner of Education, when he quoted the following statement from Grant Venn's book, Man, Education, and Manpower: "If we want an educational system designed to serve each individual and to develop his creative potential in a self-directing way, then we have work to do and attitudes to change." Marland continued in his own words: "The first attitude that we should change, I suggest, is our own."

As a boy, I remember a story my father told me about his youth in China. It went something like this:

When my father was a boy in 1920, there was a hill near his home called Beh-Gee-Go. On this hill was a cannon which had been fired at noon each day since the 1850's as a time signal. My father decided one day that it would be interesting to walk up the hill and see the old cannon. This he did and then noticed a nearby pagoda. He walked into the pagoda and saw a bell resting in a wooden frame. The top of the bell was roped to a wooden arm, and there were designs in the casting. It was a large bell, some eight feet high. My father noticed an old Chinese gentleman near the bell and asked him who had made it. The old Chinese gentleman told the following:

Emperor Ming of China wanted a bell that was the largest and best-sounding bell in China. He heard that there was a craftsman who lived in the Yangtze River area who could fashion and work with brass effectively. By the order of Emperor Ming, this craftsman was commanded to come before him and was told to make the largest and best-sounding bell in China. The metal worker told the Emperor that this could not be done because the largest bell had already been made and it was impossible to cast a larger bell with the methods that were available at that time. The Emperor was irritated with the response and gave the craftsman one year to make the bell or be put to death. Of course, the metal worker was concerned with the ultimatum. He prepared a pattern for sand mold, and three months before the deadline made a casting which had a flaw. The brass did not flow into one of the sections of the bell. The bellmaker was extremely disturbed because he had little time to prepare another mold. So the artisan went to a soothsayer and asked him what to do. The soothsayer said that it would take human sacrifice, that life had to be put into the bell for the sweetest sound. The artisan told his family, which consisted of his wife and two beautiful daughters, what the soothsayer said, but that he, himself, did not know what he meant. Time passed and the artisan made another sand mold, and before long he melted the brass down. When it was at the right temperature for molding and had the proper color, the craftsman's older daughter suddenly threw herself into the molten metal and was immediately consumed. The artisan, extremely heavy in heart, wondered what he could do now, but there was nothing to do but continue. He therefore poured the molten metal into the sand casting. When the bell cooled and was put into its proper holding device, it was perfect in molding, in fusion, and in tone.

My father went on to tell that as you might expect of an eleven-year-old boy, he looked around for a stick or something to hit the bell. Dad said the tone was deep and mellow. As he went on to talk to the old Chinese gentleman, the man said that from upstairs he could see the carvings of the two sisters, the mother, and the father, and particularly the image of the daughter who was so devoted to her parents. The old man went on to tell how those children and the bell had become a symbol in China of the devotion of children to their parents and the need for individuals to dedicate their complete selves to what they are doing.

Let me rephrase what the old Chinese man said. Are we as teachers willing to put our all into our profession? If our profession is to continue to be a great profession, it will be necessary for us to dedicate ourselves fully to it. Can we do it? Will we do it? Gentlemen, I think we can. I pray that you and I will.

Dr. Williams is chairman of the Industrial Education Department, East Tennessee State University, Johnson City, Tennessee.

Electronics

The "Learning Activities Packages" Concept in Basic Electronics

Robert G. Groth

A year ago when I attended the national convention at Miami Beach, two special interest sessions aroused my curiosity. In the program schedule, the term "individualized instruction" attracted my attention. For a long time, I had been seeking ways to individualize the instruction in basic electricity-electronics, a course which I had been teaching for several years. This prompted me to attend these particular sessions in an effort to discover ways to introduce a more student-centered approach to the subject.

As I listened to the speakers and watched their illustrations, it became evident that they were describing a "LAP" method of instruction—an approach which was completely unfamiliar to me as well as to the district in which I teach. I learned that "L.A.P." stands for "Learning Activity Packages." This approach seemed to be a departure from the usual "instruction sheet" type of assist which is so prevalent in industrial arts today. I have also since discovered that LAP programs are in use throughout the country, thinly scattered, but operating in a wide variety of subject areas. Although the basic idea of the learning packet is common to all of them, there seems to be a very wide range of differences in their applications to their various situations. So, using only the basic concept of the activity package and without any further research into the method, I proceeded to tailor a program in an effort to develop the individualization I was looking for.

THE LAP-PACK

Strangely, the LAP-Pack itself is NOT the major instructional instrument of the program. It is merely a folder (in my case) containing the framework and the direction a student follows in his study of a given unit of work. It includes a list of objectives, a pre-test, and a list of selected activities. The heart of the program is the wide variety of resources on the activity list.

The subject matter content consists of 34 LAP-Packs covering the usual sequence of topics in basic electricity. The student proceeds through these units in sequential order and at his own rate, thereby, to a large extent, assuming the responsibility for his own learning.

THE OBJECTIVES AND PRE-TEST

When a student begins his work with a particular LAP-Pack, he first sees a list of objectives expressed as things he will be able to DO upon successful completion of the pack. Next, he turns to the pre-test which, together with the objectives, indicates the nature and scope of the topic to be covered. This set of questions and problems may be used in any way the student chooses. Since the answers are readily available to the student, he may use the pre-test questions and answers as a practice test, as a series of problems to solve while researching, or in any other way he feels will help to learn and understand the concepts. However the pre-test is used, it is indicative of what the student should know before taking the final (mastery) test.

The pre-test problems, unlike those of the mastery test, are, for the most part, subjective. This is the means used to induce students to organize thoughts in their own way and to express them in their own words. In many instances, this leads to meaningful dialogue between teacher and student, particularly when there is difficulty in conceptual understanding.

THE ACTIVITIES

The list of activities includes those particular assignments which will help the student to attain the objectives of the LAP-Pack. The total of these resources consists of several textbooks and pamphlets, experiments, projects, film loops, strips, motion picture films, demonstration (model) packs, practice problems, programmed learning units, and prepared overhead transparencies. One of the most effective resources is the teacher himself. Circulating about the room, he is able to deal with individuals by assisting, explaining, and encouraging students with their research.

Not ALL LAP-Packs offer ALL resources as study aids. Only appropriate references are selected and listed for each LAP-Pack; from this list, the student chooses the ones which appeal to him. Some prefer to rely on texts and other reading matter, while others may favor the use of projected materials as their means of attaining the objectives. Although most students tend to do all of the listed activities, the choice is theirs, and they soon determine for themselves which of the materials are best for them.

THE MASTERY TEST

Having satisfied himself that his research is complete and that he has reached the objectives of the LAP-Pack, the student then requests a copy of the mastery test. This examination is taken without the use of notes or consultation of any kind, since it serves to evaluate the degree to which the student has mastered the work. If the student is satisfied with his score, it is recorded, and his work on the next LAP-Pack may begin.

If the student does not achieve a high score on the mastery test, it becomes obvious to him that he has not done enough research. In this case, he is encouraged to return to the resources to continue his study until such time as he feels ready to take the mastery test again. This procedure may be repeated as often as necessary until the mastery of concepts is evident to both the student and the teacher. Since the final grade on the LAP-Pack is the average of all the mastery test attempts, the student soon realizes that he has more to gain, grade-wise, if he delays taking the mastery test until he is certain that concepts HAVE been mastered.

GRADING

In most individualized study programs, the assignment of grades is apt to be a problem. No matter what system of grading a school uses, it is usually structured to compare students with each other or to a particular standard. If the teacher is to adopt the philosophy that a student should be taught and graded relative only to his own ability, how can this be made consistent with an A-B-C-D system, a percentage structure, or any other standardized method of grading which a school may demand?

The grading of students enrolled in a LAP program is based on a formula reflecting the number of LAP-Packs completed and their scores. This method allows the student to earn his grade through high quality work OR by rapid advancement. Although many students earn high report card grades by excelling in both of these elements, most others can achieve reasonably good grades through a strength in only one of them. Some students who earn high LAP-Pack scores may not progress rapidly, while for others the opposite may be true.

For the present, at least, this approach to grading students appears to satisfy most of them, especially since they are fully aware of their ability to control at least one of the grading factors.

The method, although not strictly an individualized one, is a compromise between an individualized plan and one which satisfies the requirement of submitting standardized grades to the school office.

CONCLUSIONS

This is a linear type of program. Although there are occasional opportunities for students to work in special interest areas, all students progress essentially on a single track. LAP programs in some subject areas are especially conducive to a branching type of structure in which students, by design, are directed to their various areas of interest. However, since the study of basic electricity-electronics is a sequential one, a linear program was selected as a means of assuring that the students learn concepts in their proper order. As this program develops further, it is expected that more branching opportunities will be offered and, at the same time, the linear nature will be retained.

The LAP program described is in its first year of operation at Valley Regional High School. Although it is difficult to appraise a course before a year's end, it appears at this time that the learning atmosphere is vastly more effective than that of the previous year's traditional approach. For this reason, it is expected that, after careful revision of some of the details, the program will be continued next year.

Mr. Groth is chairman of the industrial arts department at Valley Regional High School in Deep River, Connecticut.

Individualizing Projects in Electronics

Larry Heath

The title assigned for this presentation may be a little misleading. A more appropriate title would be, "An Individualized Curriculum for Electronics." I would like to share with you a project on which we have been working in Oregon for the past two years. The project is called "I.C.E." These letters stand for "Individualized Curriculum for Electronics." I would like to begin by giving you a brief overview of the Individualized Curriculum for Electronics project. Secondly, I would like to share with you a little philosophy about individualized instruction and then conclude with the reactions and results of the Individualized Curriculum for Electronics project. At the conclusion of my report, I would like to have questions so that we may get into some of the details in which you will be interested.

The major purpose of the researchproject was to prepare instructional materials for the first-year technical electronics curriculum that would allow students to enter the program, based on their knowledge; enter any time during the year; and progress in the program at their own pace.

Several Oregon community colleges, Oregon Technical Institute, and Oregon State University cooperated in the writing, implementation, and evaluation of the materials.

In April of 1970, the Individualized Curriculum for Electronics project was funded by the Oregon Educational Coordinating Council. Prior to the actual funding, all community colleges in the state of Oregon had been contacted concerning the proposed program. All had committed themselves in support of the program and had furnished the name of an electronics instructor who would assist in the actual writing of the learning packages. Upon notification of the funding, arrangements were completed at Lane Community College, which was joint sponsor of the project with Oregon State University, for the physical spaces and secretarial assistance.

The electronics instructors who were to participate in the project met at Oregon State University on May 22. The concept of individualized learning and individual learning packages was discussed. An expert from the Northwest Regional Educational Laboratory made a presentation. The instructors were given information outlining the format of the learning packages and wrote some sample behavioral objectives.

On June 5 and 6, a two-day workshop was held at Lane Community College. The group made decisions finalizing the format of the learning packages, determining exactly what areas of the electronics curriculum would be covered and which of the writers would take each area. Each writer was then directed to break his area down to specific behavioral objectives prior to the actual starting date of the project on June 22. Ten areas of study common to six occupations in the electrical-electronics technologies were selected. These included: Occupations; Terminology; Instruments; Schematics; Devices; Basic Theory; Circuits; Diagnosis; Construction; and Mathematics. Research conducted with Oregon State University and federal, state, and local employment services indicated that students who were skilled in the following occupations were most likely to find employment, if not in their local area, then in the State of Oregon: Electronics Engineering Technician; Electronics Assembler; Industrial Electronics Technician; Electronics Service Technician; Electronics Mechanics; and Electrical Appliance Serviceman. Task analyses were obtained for each of the occupations and used as a basis for finalizing those behavioral objectives that would be most valuable for the students. Sample behavioral objectives were again written and critiqued by the group.

The writing of the materials occurred at Lane Community College between June 22, 1970, and August 1, 1970. The writers developed 138 learning packages that encompassed the first year of the technical program. The writers were sent from each of the schools that planned to use the materials. Lane Community College printed 500 copies of the instructional materials (a total of 1.5 million pages).

Prior to the opening of school in September 1970, all the colleges had received their learning packages and were ready to start the program. Visitations were made to each school to assist in the actual functional procedures in the electronics laboratories.

Three meetings with the electronics instructors who were teaching the program were held. Problems and experiences were shared. Methods for revising the instruction and for motivating the students were exchanged and, for the most part, became standard operating procedure.

After the first year, funds were obtained to rewrite all of the materials. The writing staff was expanded to a total of 25. It was also decided to expand the program to include the second year of the community college programs and two years (eleventh and twelfth grades) of the high school program. This revised Individualized Curriculum for Electronics program allows a student to start in high school and to continue studying electronics on a continuous growth program through to employment. This can be done whether the employment is after high school, after one year of college, or after four years of college.

There are currently approximately 700 students in the following 16 schools who are presently utilizing the Individualized Curriculum for Electronics program.

<u>High Schools</u>

Cascade Union High School
Route 1
Turner, Oregon 97392

Crook County High School
East First Street
Prineville, Oregon 97754

Estacada Union High School
350 Northeast Seventh
Estacada, Oregon 97023

North Bend Senior High School
Fourteenth and Pacific
North Bend, Oregon 97459

Occupational Skills Center
14211 Southeast Johnson Road
Milwaukie, Oregon 97222

South Eugene High School
400 East 19th Avenue
Eugene, Oregon 97401

Washington High School
531 Southeast 14th Avenue
Portland, Oregon 97214

Wilson High School
1151 Southwest Vermont Street
Portland, Oregon 97219

Benson Polytechnic High School
546 Northeast Twelfth Avenue
Portland, Oregon 97232

David Douglas Senior High School
1500 Southeast 130th Avenue
Portland, Oregon 97233

<u>Community Colleges</u>

Central Oregon Community College
College Way
Bend, Oregon 97701

Chemeketa Community College
4389 Satter Drive, Northeast
Salem, Oregon 97303

Clackamas Community College
19600 South Molalla Avenue
Oregon City, Oregon 97045

Clatsop Community College
Sixteenth and Jerome
Astoria, Oregon 97103

Oregon State University
Department of Industrial Education
Corvallis, Oregon 97331

Southwestern Oregon Community College
Coos Bay
Oregon 97420

INDIVIDUALIZED CURRICULUM FOR ELECTRONICS PACKAGES

The learning packages are written with the following format:

Learning Package System
Basic Format

1. <u>TITLE AND/OR PACKAGE NUMBER</u>

   Name ______________________________

   Date Started ______________________________

   Date to be Completed ______________________________

   Concept: This should be a specific statement of the idea, skill, or attitude to be learned. One sentence is usually sufficient.

   Purpose: This is the rationale, <u>in the student's terms</u>, indicating why he should learn the contents of this package. One paragraph should be enough.

2. <u>PRE-TEST</u>
   All of the tests for each package should be of equivalent form of the same test. The pre-test should be made available separate from the learning package and should be taken

before the student starts on the package. If the student scores at the criterion* level, he should skip the package. He may elect to use the package to learn the parts of the pre-test that he did not perform at level on, or he may elect to do the entire package. All of the tests should reflect exactly the contents of the package.

3. LEARNING OBJECTIVES
The learning objectives should be stated in behavioral terms and contain three basic elements:

(1) The performance expected of the learner.
(2) The conditions under which the performance will be measured.
(3) The proficiency level expected of the learner.

4. LEARNING ACTIVITIES

A. This is a listing of the activities a student may engage in to learn the above-stated objective(s). The activities should be as diversified as possible and provide for a broad range of interest and ability levels.

B. Reasons, in student terms, for each learning activity should be clearly stated. This helps the student decide exactly which learning activities he will do.

Areas to consider for A and B:

Sources	Reasons
Materials: Textbooks, periodicals, pamphlets, laboratory experiments, worksheets, information sheets, exercises, charts, projects, etc.	Clearly summarize exactly what is presented in each activity. See sample below.
Media: Films, filmstrips, records, tape recordings, film loops, video tapes, pictures, etc.	
Methods: Large groups for media, small groups for discussions, teacher-pupil conference, individual research in resource center, etc.	
Sample	
Grob: Applications of Electronics, pages 33-35.	This gives a general description of how a transistor amplifier circuit processes the signal.

5. SELF TEST
This should be constructed as described under pre-test. Be sure to make the pre-, post-, and self-tests as equivalent forms of the same test. The self-test should be a regular part of the learning package.

6. POST-TEST
See pre-test and self-test. For each item on the post-test, there should be instructions for additional information, or what to do to re-learn, if the question is missed.

OPTIONAL

1. A pre-test might be given for the following unit to see if the person may have picked up additional information to skip the next package. This can be done for systems that are designed on the linear model.

2. For parallel-designed learning systems, the student should be given a list of choices for which he is qualified at the conclusion of each package.

*The criterion level may be set by the individual teacher. In some cases, levels of 80% are sufficient; other times, 100% may be required.

You probably have experience as a teacher and are listening to me today as a result of your own professional curiosity. Individualized instruction concepts have been developed to help solve some of the frustrations of traditional teaching.

The rewards in education come from the success of your students. As an experienced teacher, you have felt the grief of some of your students not being as successful as you thought they might have been. This curriculum is designed to help you have the time to get to know each student, to help him identify his goals, and to help him learn how to reach his own goals.

With an individualized program, your students will have greater opportunity to work at their own pace and toward their own goals. But there is one thing that needs to be stressed from the very beginning. Individualized instruction is not each student going to a learning carrell and being programmed with audiovisual and other hardware. All of these techniques may be open to the student. But the central process of individualized instruction (or personalized, or any other name) is that it allows and encourages the student to interact more with other people. The time that the student usually spends passively listening (or not listening) to lectures and other group activity is now spent talking to other students, questioning the teacher, growing, probing, learning.

Most teachers will agree that motivation is the key to helping a student learn. If Johnny really wants to learn something, just get out of his way. But what if he doesn't? That becomes the battle.

Individualized instruction is designed to put the student's interest at the very heart of the educational process. If the teacher can help the student identify his own interests and then build a program by helping the student broaden his interests, the teacher and the student have both increased their chances of success.

Being faced with 20 to 30 students per class period, four, five, or even six hours per day, usually precludes the teacher's remotest dream of getting to know his students very well, let alone helping them identify interests and then having each student follow his individualized interests.

With these kinds of loads, even the most organized teacher must give demonstrations to large groups, lecture whenever he wants to convey information, and always aim for that mythical middle of the group—Johnny Average.

Many students like large group instruction very well. They hide in the crowd. As long as they are quiet and make some reasonable effort to do what the teacher asks, they do very well. Students can actually get along very well in school and never have to think!

Educational thought in the past five years has focused on the importance of helping the student learn to learn and become a self-reliant person who can make effective decisions when faced with alternatives. Since we know that people learn what they do, it seems important that schools allow, no, demand that students learn to make decisions. This must be done in the normal classroom, every day.

With these thoughts as an introduction, let us look at a summary of the unique features of individualized instruction.

MAJOR FEATURES OF INDIVIDUALIZED INSTRUCTION—FROM THE STUDENT'S POINT OF VIEW

Self-paced: The student progresses at the pace best suited to his learning. He is allowed to go fast or to take the time to study in depth.

Open entry, open exit: The student may start learning any day of the year.

Performance placement: The student is given credit for what he may already know so that he always starts learning something new. The challenge is always presented.

MAJOR FEATURES OF INDIVIDUALIZED INSTRUCTION—FROM THE TEACHER'S POINT OF VIEW

He can now spend more time with each individual student. Less time is spent in large group lectures and demonstrations.

Emphasis can be placed on motivation. The teacher concentrates his energies on providing different ways students can learn, rather than dictating THE way all must learn.

Grading is removed. The student keeps the records of what he has learned; he is then given credit for what he has accomplished.

More creativity time. With the basic instruction process carefully defined, the teacher has time to design activities that will reflect his unique abilities.

MAJOR FEATURES OF INDIVIDUALIZED INSTRUCTION— FROM THE ADMINISTRATOR'S POINT OF VIEW

What the students are learning is defined. This can be easily communicated to the parents and the public.

More flexibility in scheduling students. As students come to and leave the school, they can be enrolled in classes they are interested in, with confidence that they will "fit in" and be able to profit from the work.

Articulation is accomplished. Students go from one level of school to another (high school to community college, etc.) with a written record of exactly what they know and can do. They can continue to learn on a continuous path at the new level.

MAJOR FEATURES OF INDIVIDUALIZED INSTRUCTION— FROM THE COUNSELOR'S POINT OF VIEW

Students have choices of learning styles and pace. They are confident they will be able to be successful.

Course content is defined. Students don't have to sign up for courses "blind". Expectations are clearly laid out and the student can make choices.

Student interests can be pursued. Career choices, avocational interests, and curiosities may be investigated by the students. They have some say in what and how they will learn.

If all of the above sounds dreamy, or considerably different from your school, I hope you will consider the points seriously. In this package, I hope to show exactly how you can accomplish the above in your school.

A picture of a school that was fully individualized would look very much like a modern shopping center. Great emphasis is placed on student (customer) choice and interests. Time and care is taken to make the school (shopping center) an attractive, interesting place to be. Involvement on the part of the student is emphasized. Functional design would be fully considered. The total school would reflect the administration's clear concept of what should occur in the school, and all conveniences would be submitted to the test of their contribution to the accomplishment of the goals.

I have attempted to present an honest picture, in capsule, of what individualized instruction is, what it leads to, and the foundation upon which it is based. The underlying philosophy of individualized instruction is that students can only learn to become self-actualizing, self-directed people by being given an opportunity to do so.

If, at this time, you feel that students cannot make decisions that are valid, that they must be directed in every detail of their work by an expert, then I would suggest that you should carefully re-examine any intention to try individualizing your instruction.

MAJOR CHANGES

To take full advantage of the concepts of individualized instruction, there are two significant functions the instructor must be aware of. First, he must abandon the group lecture, laboratory sequence. He becomes a source of information or consultant to the individual student or group of students who are faced with specific problems. In doing this, the instructor recognizes that each student learns at a different rate and often by different methods. He also recognizes that there is a wide range of individual differences, and he must deal separately with each one to foster the spirit of inquiry. The key is to heighten interest or motivation. The student has selected this subject for a reason, and the instructor's role is to enhance the student's interest in many ways. By treating each student as an individual, helping him evaluate his potential, and directing him into areas where he can find successful experiences, the teacher will help the student's motivation to continue.

Second, if students are given advanced placement for prior experience, the results will be a class in which the range of placement will be wide. The instructor must be prepared to give students information which varies from the very basic concepts to the more advanced during the same class period. Students have been very adamant about the fact that they need assistance about the particular learning package they are using at the time they are doing it. The inference for the instructor is that he needs a firm grasp of the full range of concepts covered in the course at hand. Immediate feedback has proven to be of great value in helping students learn. The instructor needs to supply the immediate feedback where the information is not in the package or in the referenced material.

What follows are some suggestions and possible guides to help make individualized instruction a successful experience for both the student and instructor. Individualized instruction has as its basis three philosophical concepts. These are: each student learns at a rate best suited to his individual needs: the student is given credit for previous experience and education: the student may enter the program at any time during the school year.

Ideally, then, the student can enter the program any time, to the depth for which his experience has prepared him, and can move through the instructional materials at his own best speed.

In many schools, this is not practical. The instructor has pressure on him to give grades for a specified amount of work done by each student. This results in having to require each student to go through a certain number of learning packages before he can get a grade. The students who are sharp may feel held back, while the slow ones have to pass up opportunities to better understand the materials because they do not have time to spend with it. Many times, the experiments are skipped because there is not enough time to do them and, consequently, the student loses valuable experience.

If the student is required to do a prescribed amount of learning packages within time limitations, the underlying concept of individualized instruction is lost. The process ends up being substituted for lectures.

Students have reacted strongly to this direct substitution of learning packages for lecture method. It has resulted in a good deal of frustration for them, in that they feel they are not getting anything better. They only find it more difficult to see the instructor for help with their problems.

To have a really successful individualized instructional program, the instructor must work out a way to let the students progress as nearly at their own rate as possible. There must be certain guidelines, but they should take the form of an agreement between the instructor and the student. Both have expectations. The student wants to achieve to a certain level, and the instructor should be very careful to understand what the student wants and help him be realistic and at the same time supply as much motivation as possible.

If the instructor and the student can come to a tacit agreement about where the student should be after a certain time in the program, then they both have the same expectations, which will allow the student to move along while getting the most he possibly can from the program.

In dealing with the student, the teacher needs to use a combination of face-to-face conversations, small group discussions, and total class seminars. This encourages the students to communicate with the teacher in several different ways. It also encourages student-to-student communication.

Successful introduction of an operating individualized instruction program requires that the instructor revise some of the methods that are now in use. Some of the changes that are already apparent will be:

The daily class lecture is no longer necessary. The instructor's role should become that of a consultant. A variety of methods should be used, such as individual help, small group demonstrations and seminars.

It is necessary to give information to students concerning concepts scattered over much of the program. The instructor has to be prepared to answer, at any time, questions ranging from basic to advanced theory.

The learning packages constitute more paperwork. Methods need to be worked out to take care of the extra work, such as grading pre- and post-tests. Students should be encouraged to help with this wherever possible.

Techniques must be instituted to ensure that the student spends enough time in the laboratory or classroom to achieve his goals. Required attendance is recommended.

Student progress needs to be evaluated on a continuing basis. New procedures and methods become necessary to do this satisfactorily. Students should be involved in maintaining these records.

A wide variety of resource materials must be easily available to the student; a system which will allow students full utilization of these materials, yet allow them to circulate freely if necessary.

The range of experiments being conducted by the students will be wide. The necessary components for these experiments must be readily accessible.

Projects and repair activities should be used extensively to help the student apply his technical knowledge.

Laboratory facilities will remain much the same. The change here must be in the hours that the laboratory and the instructor are available to the student. Laboratory time for the student is very important, yet must fit his schedule.

Individualized instruction is superior to the lecture method, according to the majority of the students who have experienced it. The fact remains, however, that its success depends largely on the instructor. Each instructor must adapt the program to his individual laboratory and classroom situation. He must make it work.

Problems: The major problems teachers and students have had with individualized instruction include the following:

Grades: A mastery, no-credit system is ideal for individualized instruction. Other alternatives include pass-fail, variable credits, and simply giving "A" credit for the work a student completes. Regardless of the system, it should encourage the student to learn, not to memorize.

Motivation: Some teachers have thought individualized instruction should be operated like independent study. Nothing is further from the truth. The teacher needs to start the students as a group (the way the students were previously begun) and then help each student set goals and identify ways to learn. As a result, after the student gains experience, he will be able to function largely on his own. The teacher should continually encourage student-to-student instruction and teacher-student conversations. The total purpose of individualized instruction is to increase the amount of time the instructor has to help the students.

Papers, tests, etc.: The teacher has to get things organized so he is not spending all his time grading papers. He can have the students do it themselves—have advanced students help—or take them home at night. But he should not hide behind a large stack of papers during classtime. He has to be helping the students!

Multiple learning methods: Students should use many resources for learning. These can include projects, experiments, many reference books, field trips, guest speakers, even the teacher. Audio-visual materials such as film loops, audio tapes, and tape-slide sequences should be used wherever possible.

Advantages: Many people feel individualized instruction is better than the traditional lecture-laboratory way we have been teaching. The major advantages include the following:

Pace of learning: Students can learn at their own pace. They are not held up or pushed by a group. They are able to learn content and are not competing for grades.

Personalization: The teacher is there to help the student learn, rather than punish because of student failure. The total process is success-oriented. Teachers and students are working together to find new ways to learn, rather than inventing new punishments for failure.

Responsibility (Involvement): The student gets to make some decisions that count. He is able to help decide what he will learn and how he will learn it. This gets him involved! Thus, motivated! By caring what the student thinks and wants, the teacher is able to communicate with the student and help him. As the student learns, he demonstrates to himself that he is responsible and can learn.

Communication: What is to be learned and what has been learned is defined (master package list, etc.); therefore, people can talk about it. Articulation with advanced training schools (community colleges, industrial, etc.) is possible. Other subjects (English, math, science, etc.) can relate to what each student is learning at any point in time. Interdisciplinary studies are made possible because the subject matter is defined. (It is not locked up in the teacher's mind and kept secret from all unwashed people!)

CONCLUSIONS AND FUTURE PROJECTIONS

As of this date, the success of the Individualized Curriculum in Electronics project is being measured in student enthusiasm and teacher acceptance. Some unsolicited comments from students include:

"I have to work weird hours. If it weren't for I.C.E., I couldn't stay in school."

"I would have had to wait until next fall before I could get into a program. It has saved me six months of waiting because I can get into it now."

"I like to work independently. If I can take my time, I understand the material much better."

"All the time I put into I.C.E. is productive. There is no busy work. I find I get out of it what I put into it."

"This is great! If this is the way education is going, I'm for it."

The college presidents of Oregon's community colleges met recently and designated the Individualized Curriculum for Electronics project as the Number One priority for further development.

The Individualized Curriculum for Electronics is serving as the model for curriculum materials development in the areas of automotives, metals, and several other technical subjects.

The Individualized Curriculum for Electronics materials will be edited and added to this year. The third edition will be available to any high school program in Oregon.

Ten pilot schools are being selected to try the Individualized Curriculum for Electronics program on a national basis.

In conclusion, the Individualized Curriculum for Electronics program seems to be helping teachers establish a flexible, dynamic relationship with their students.

Grading

Mastery Evaluation

Lee H. Smalley

Mastery evaluation is a relatively new concept in education. Most people were first introduced to it in 1968 with an article by Benjamin Bloom. This is a most important concept at this time for we have the quantity, all of the children of all of the people not otherwise institutionalized, in school (at least to a much greater degree than any other country) and so now should work on the quality of instruction. Also, because of the more complex nature of our technological democracy, our society demands more of its citizens, which puts a greater degree of responsibility on the schools to prepare people to function and contribute to such a society.

GOAL OF TEACHING

A. To teach 90% of the selected content to 90% of the students you have in class.
B. To select content, ask three questions:
   1. Why do I want them to learn it?
   2. Once they have learned it, what will they do with it?
   3. Once they have learned it, how long should they remember it?
C. To teach for mastery:
   1. Teachers must use any means to get students to master the objectives.
   2. Do not keep time constant for all learners.
   3. Evaluate the objectives.
   4. Give treatment until objectives are mastered.

PROBLEMS WITH TYPICAL EVALUATION TECHNIQUES

A. Common procedures:
   1. Process the majority regardless of learning.
   2. Teacher presents content, regardless of learning.
   3. Equate high standards to per cent of failure.
   4. Students have to guess what they are being evaluated for.
B. The "Normal" Curve
   1. The theoretical normal curve is based on chance and sample.
   2. Good teaching should be by design, not chance, and the results should not approximate a normal curve.
   3. It is based on the assumption that students would fall into slots, and the job of the teacher is to select students for one of the slots.
   4. Norm-based evaluation thus placed the accusing finger of non-learning on the student and absolved the teacher from poor teaching.
   5. We proceed in our teaching as though only a minority of our students should be able to learn what we have to teach.

SEQUENCE FOR MASTERY EVALUATION

A. Develop student behavioral objectives with specified performance criteria.
B. Develop test items from the objectives.
C. Determine the entry level behavior needed.
D. Assess where the learner is before instruction takes place.
E. Learning takes place continuously.
F. Self tests or practice for the student to see if he can achieve the objectives.
G. Mastery test for the teacher to see if the student achieves the objectives.

METHOD OF GRADING

A. Grades should only be recorded as A, B, or Inc. (C may be used if content is not critical.)
B. B is when a student has successfully mastered the performance criteria as indicated in the objectives.

C. A is when a student achieves a B grade, plus successfully completes additional projects relating to the class, which are initiated by the student.
D. An incomplete is given when the student does not achieve the performance criteria indicated.

REMEMBER

A. Student errors are opportunities for teachers to teach.
B. Learners need to learn how to learn, not just what to learn.
C. Creative teaching should be defined as creative ways of getting more students to learn more.
D. Teachers should be evaluated on the basis of student learning.

CONCLUSION

No longer is it necessary to "play games" with students. If the te· ıer prepares behavioral objectives with the intent, conditions, and performance criteria included and gives these to the students on the first day of class, the evaluation should not be a secretive thing. The student will know before the teacher does when he has successfully mastered the objectives.

Another advantage of mastery evaluation is that every teacher can initiate this in his own instruction, without asking anyone else. You just go ahead and do it!

Not since the development of audio-visual aids has there been a concept that holds greater promise for improving instruction.

Dr. Smalley is a professor of Industrial Teacher Education at the University of Wisconsin-Stout, Menomonie, Wisconsin, 54751.

What Is a Grade?

Charles E. Earhart

There are as many different interpretations of a grade as systems of grading. About eight years ago, my fellow teachers and I decided it was time to do something about uniformity in a grade. Our first approach was contacting industries to learn what is expected from our graduates. Were they finding serious weaknesses in our industrial arts graduates? The results of this survey were very helpful in determining "What is a Grade?" The young people we have in class every day are the future wage earners in industry and products of our own teaching.

Personnel directors informed us they prefer applicants with a proper attitude about work, one who can take instructions, constructive criticism, and be able to get along with his fellow workers.

It was Clement Stone who said: "There is a very little difference in people, but that little difference makes a big difference. The little difference is attitude. The big difference is whether it is positive or negative."

Knowing how to work safely with materials and machines is just as important as working safely around other people. Accidents don't just happen; they are caused. An unsafe worker has no place in industry now or in the future. The safety habits students are taught in our classes or permitted to practice very day become a part of their attitude toward safety. Enforcement of proper safety methods is the best insurance.

Proper work habits should be taught and practiced in a school lab with the introduction of each new machine or area of study. The old saying "we teach as we were taught" can be revised to read: "Workers work as they are taught." So, if we practice what we teach, then follow up on each student in the development of his work habits, the remainder is up to the individual.

Cooperation in the learning process is not only a "must" among students, but between students and teachers. This is also necessary for parents, teachers, and the administration. Learning to live and work with others is a basic fundamental of an industrial society.

Initiative, according to Webster, is "serving to initiate, or begin." After students have been properly instructed as to what is expected of them, are they ready to start working without further delay? Do they have a set routine in starting to work every day? Do they visit a while, get a drink, go to the rest room, or just plain kill time until everyone else is busy? A few lost minutes every day can run into many hours a month with nothing to show for their lost initiative. Don't let our young people get the habit of a retired worker's comment: "My get up and go—got up and went."

Written work is an unfortunate necessity in school, and many teachers place too much emphasis on test results. A student can memorize the correct answers, but may not be able to apply them on the job. A written test can also reflect whether the teacher has taught. When this prospective worker gets a job, who knows whether he received an "A" or "D" in a certain subject? The important thing is whether he can prepare or produce what is expected by an employer. Learning to think, making decisions, and knowing where to find the correct answers are just as important as being a straight "A" student on paper.

Punctuality may not seem a very important factor as far as a grade is concerned, but the first class in the morning can be a disaster if students are permitted to arrive without some uniform starting time. One of the most serious problems of industry today is being late for work.

The attendance record of a former student is one of the first questions asked when a prospective employer calls about a job applicant. We insist on a good attendance record in our evaluation of a student. One who sets a pattern of taking Mondays or Fridays off is reminded of this early in his high school career. When the student is absent, he is not learning, and when he misses work, his employer will be looking for a replacement. Absenteeism increases the cost of a product in many industries.

The progress a student makes can be quickly observed by the kind or type of a work project he selects. This is especially true with students coming into our classes for a second or third year. Some will want to make or do a problem that is almost a repeat of work for beginners. Others will strive to get as many new experiences as possible in their daily work.

Our senior class is usually building some piece of equipment for other departments of the school system. This provides an excellent opportunity to observe the suggestions and ideas from different students. We usually get the class, or those available, to look at the situation and analyze the problem. It is always refreshing to hear a student's remarks; otherwise, we would never know his thinking. The informal atmosphere in an industrial arts class provides our profession the opportunity to evaluate the student as a whole better than most other classrooms.

Conduct is another area that will result in an immediate dismissal from the job if it is not controlled. Fighting is probably one of the most common problems in school. Smoking in class or in the rest room can be serious, and the dangers should be stressed continually. There are flammable materials and gases in many of our labs, and smoking could cause extensive damage. One of the best ways found to keep conduct on a positive basis is to try to keep them busy. Idle hands and minds can be a real hazard in a class, so it's up to the teacher to keep it a safe place for learning and working.

In summarizing, a grade should reflect the student's attitude toward safe working conditions, willingness to take constructive criticism, and ability to get along with fellow workers, rather than an "A", "B", or "C". Last, but not least, be able to THINK!

Mr. Earhart is a metals teacher at Newark High School, Newark, Ohio.

What Is a Grade?

Sara L. Stangel

What is a grade?

What should a grade be?

An accurate mark given on a report of progress denoting an average score on work in a particular course based on a specific grading scale.

This is not what a grade really is. It is not an average on work: test scores, conduct, absences, and the teacher's personal opinion of the student.

It is not a report on progress. Test scores are averaged together: if the student makes good progress but does not raise his grade number-wise, he gets no credit for his progress.

There is no specific grade scale. Different teachers use different scales. Students with easier teachers make better grades than those with hard teachers, but aren't necessarily better students.

So a grade is actually a mark given by a teacher denoting what he feels the student should make based on his own grading system and according to his personal opinion of the student.

This is bad for the student because his grade is lowered if the teacher doesn't like him. His grade average is hurt if he has a harder teacher—once you are in "honors," it is almost impossible to get out. This discourages students who might otherwise make good grades. Parents usually think the first definition is how it is and pressure students.

Three types of students result with this grading system. Dropouts are discouraged students who either finally convinced themselves that they were dumb or got so shot down they developed insensitivity and just didn't care. Often, to keep grades, students resort to cheating—even good students who get stuck with hard or bad teachers. There are a few LUCKY ones—teacher's pets and those who have above average grades anyway.

Some administrators have realized that grades aren't what they should be and have tried several other ways, but these haven't worked. Teacher comments actually mean that most teachers have 3 comments on rubber stamps. Progress reports have been tried, but teachers are told if the students completed the minimum required work, give them the highest mark.

What can be done? One grading system could be designed for use by all teachers. Review of all teachers would weed out bad ones and those who refuse to use the grade scale. Review of courses and dividing each course into levels depending on student ability might help. Aptitude tests for placement should be given each semester. Tests in vocational subjects and courses in vocational fields should be offered; not everyone was meant for a general college degree.

Sara Stangel is a senior at Sunset High School, Dallas, Texas.

Handicapped Students

Teaching the Functions of Industry to the Educable Mentally Retarded Student

Rick Veteto

The purpose of my presentation is to illustrate methods in which the "Functions of Industry" approach to manufacturing may be related to the educable mentally retarded (EMR) student.

Before we investigate some of these methods, let us look at some general characteristics of the EMR student that affect his ability or inability to learn within our present educational systems.

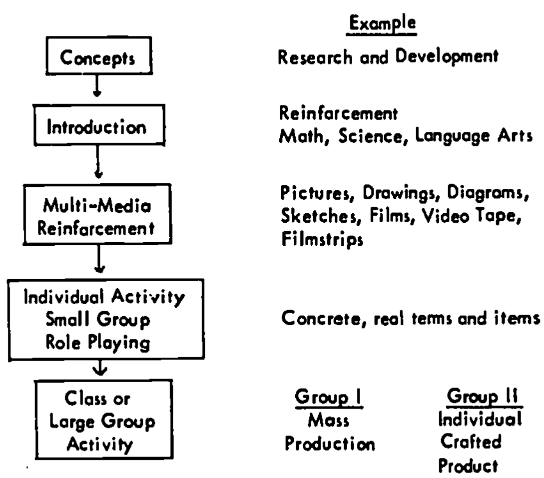
The EMR student has an I.Q. range of 50-80 and experiences much difficulty in learning through abstractions. He lacks interest in most school subjects because of constant failures and refuses to cooperate with teachers and peers on an individual or group basis. He seeks attention and advice constantly from parents, teachers, and peers, since he cannot accept responsibility for his own actions and criticism. He makes unrealistic vocational choices and is 3-5 years behind his peers in vocational maturity, being extremely selective concerning interests. He is socially and emotionally less mature than his "average" peers and has a very poor self-concept.

With these characteristics in mind, let us look now at the technologies or functions of industry whereby man changes raw materials into finished products and investigate these concepts as they relate to the slow learner.

The functions of industry as outlined in the "Common Body of Knowledge for Management Consultants," written by the Association of Consulting Management Engineers, Inc., are: organization, research and development, personnel administration, finance and control, secretarial and legal, production, marketing, and external relations.

With these functions as a base and the characteristics of the educable mentally retarded still fresh in our minds, let us investigate further a model which may be used to teach, motivate, and introduce this student to the world of work around him.

One of the most identifiable characteristics of the slow learner is his inability to deal satisfactorily with abstractions. In order to effect a successful transfer of knowledge and understanding of concepts in the EMR learner, the following model has been used in my program to relate the "Functions of Industry" to the EMR student in a realistic and concrete manner.



To observe this model in action, it is helpful to see concrete examples of the functions of industry taking place in the classroom or laboratory.

Course Outline for a Study of Manufacturing Using the "Functions of Industry" Approach

Unit I. Orientation
- A. Pre-Test
- B. Introduction to Machines
- C. Safety Operations
- D. Organization of Manufacturing Industries
- E. Teacher-Planned Mass Production of Product
- F. Job Applications
- G. Tooling-up for Production
- H. Production of Product

Unit II. Research and Development
- A. Pure Research
- B. Applied Research
- C. Partial Design Process
- D. Two Groups—Product Research
  1. Individual Product
  2. Mass Production Product

Unit III. Product Engineering
- A. Student-Prepared Designs
- B. Sales Analysis
  1. Consumer Survey
  2. Photography of Student Prototypes

Unit IV. Product Development
- A. Patent System
- B. Copyrights

Unit V. Organization of Manufacturing Enterprises
- A. Types of Manufacturing
  1. Custom
  2. Job Lot
  3. Mass
- B. Forming a Manufacturing Company
- C. Types of Companies
- D. Company Structure
- E. Elements of Production
- F. Economics of Industry

Unit VI. Personnel Administration
- A. Manpower Procurement
- B. Wages and Salaries
- C. Organization Planning and Development
- D. Organization Planning

Unit VII. Finance and Control
- A. Financing
- B. Control

Unit VIII. Secretarial and Legal
- A. Secretarial
  1. Board of Directors
  2. Stockholders
- B. Legal
  1. Employee Affairs
  2. Patents Affairs

Unit IX. Production
- A. Plant Engineering
- B. Industrial Engineering
- C. Purchasing
- D. Production Planning and Control
- E. Manufacturing
- F. Quality Control

Unit X. Marketing
- A. Market Research
- B. Advertising
- C. Sales Promotion
- D. Sales Planning
- E. Sales Operations
- F. Product Distribution

Unit XI. External Relations
- A. Opinion Appraisal
- B. Employee Information
- C. Investor Communication

In conclusion, these brief concepts are designed to illustrate a systematic approach to the introduction of manufacturing to the educable mentally retarded student. The student needs much more than concepts. He needs a dedicated and motivating teacher, positive interaction with his environment, and a successful educational experience such as that provided in an activity-based conceptual approach to manufacturing, "The Functions of Industry."

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A Program to Teach Manipulative Concepts to Culturally-Deprived Students

Jerry D. Grover

One needs no special agility in perception to notice two characteristics of contemporary American education. Most people involved in it don't like it much, and everyone wants to individualize it. These attitudes are real enough, but fake. One thing is clear though; in the classroom, a genuine riftexists between teachers and the students. Education is supposed to be facilitated by the relation between teachers and students. This is what teachers are for. But what transpires when there is a breach between teacher and students? Mistrust, resentment, misunderstanding, fear, gamesmanship, one-upmanship, failure, mutual avoidance, and precious little education. Students see school as unpleasant and irrelevant because in general that is what it is. Teachers thus see students as stubborn, immature, and cheeky. When the bell rings, everybody splits to find someone pleasant to be with and something worthwhile to do.[1]

Ralph Gallington in the 19 ACIATE Yearbook made this statement: "The greatest deterrent to school interest is the curriculum and its disregard for students' needs, interests, aptitudes, and capacities."[2] I am sure that we are all aware that these conditions exist in many schools throughout the nation, and because of these conditions, we have defined a segment of our students as being culturally deprived or disadvantaged students. I believe that cultural deprivation and disadvantaged students basically may be broken into two categories. There are those who are deprived and disadvantaged because of their economic and social standings. This could be considered a circumstantial deprivation. There is also, perhaps more important in many respects, a developmental disadvantaged, such as students who began their program of schooling and got left behind somewhere along the line. They didn't gain the cognitive concepts that were essential for them to progress with their peers. These same students were likely to have fallen behind in their development of manipulative concepts as well. These two types of conditions go hand in hand, but often we look only at the economic and the social as the main sources of being deprived or disadvantaged. Actually, the cultural deprivation, or disadvantage, is reinforced because the teachers of the schools do not teach the students at a basic enough level of concept. If the students are unable to perform at a predetermined level of expectation, they are threatened with failure and are more threatened by their peer groups.

There have been many articles written, and much discussion, as to the reasons a student is deprived or culturally inadequate. Some reason that the students come from educationally depressed areas, or perhaps small rural schools. They may have been raised in a poor social and economic situation. They may have had poor schools and/or poor teachers. These students may have been counseled in subject matter that was completely unrelated to the students' lifestyle. These are all contributing factors to a child who becomes a potential disadvantaged student, a potential dropout, and a potential problem in society. The purpose of our discussion this afternoon is not to delve into the causes of deprivation but perhaps how we, as educators, and more particularly industrial arts educators, might be able to help the students overcome this deprivation, particularly in our subject field.

I am impressed by the curriculum model that has come out from the National Office of Education. The National Office proposes that our schools be geared and oriented to career education. A sound plan would focus career education in grades K-6 on awareness. Grades 7-9 would include orientation, and grades 10-14 would concentrate on preparation.

If our schools were truly dedicated to the concept of career education, the students (our children) at the end of the twelfth or fourteenth year of schooling would be ready to move into society and not have to experience the frustration of not being adequate to the peer group or to the society in which they choose to live.

Today I would like to develop some ideas that we as educators might utilize to make our schools more effective. Our schools have utilized various ways to find the deprivation areas of a student. Traditionally, the schools have kept accumulative files on students. These files contain their grades and their progress in relation to the age and the norm of the group in which they associate and national norms. The level of achievement is further determined by a file of various test scores. It may also contain a written assessment by the teacher or counselor. These are all traditional ways that are still being utilized to try to tell us, as teachers, what a student's strengths and weaknesses might be. Many teachers are beginning to try pre-tests to see how much a student knows when he comes into the course and how much he knows when he concludes the course.

Is it possible to define more clearly a student's deficiencies and then provide a system whereby he could start out and work at his own level of understanding and progress as rapidly as he can through the subject material? The attraction of the school itself could be a very effective force in motivating the child if it was operating well. The school would draw students to it because of its interesting and motivating curricular programs. If it was functioning well, it would have programs which would bring the child's life into a direct relationship to the learning experiences of school. School must be an effective force in the disadvantaged youth's life and must be a more positive one than it has ever been before. I believe that one of the most severe problems in the school systems in America today is the assumption by the teacher and the school that a student already has a set of conceptual and manipulative concepts on which we attempt to build. Do I need to emphasize the fallacy of this assumption? Somehow, someway we need to identify the conceptual level of a student as he enters into the elementary school, as he comes into the junior high school, as he comes into the high school, or as he comes into post-secondary school. It is important that we build upon the concepts that he has already established. If we assume that the student has a set of concepts, and if we assume incorrectly, then we are going to be reinforcers and additive factors to the disadvantaged student's negative concept of himself and to his negative outlook on school and society, and we will be perpetuators of negativism and reinforcers of the school dropout.

One of our challenges is to be able to identify the concepts that a student brings into our programs. The approach and taxonomy of our industrial arts programs is extremely important to meeting the needs of youth, and we have many of these programs in existence. Many new ideas and concepts are being experimented with throughout the country. We are doing a pretty good job in this respect. Perhaps more important than all of these new programs is having a tested means of taking a student from where he is in his manipulative skills and conceptual concepts to a goal set up by the school or the teacher. Schools are doing a good job of setting up goals, but doing a very poor job of assessing where a student is or providing all students with meaningful experiences to reach the established goal. We must often require that a student repeat concepts that he has already mastered and hold him to a predetermined structured course. I think this type of education can only frustrate the highly motivated student because we are not adding sufficient challenge. We also frustrate the so-called deprived student because, in setting up the course goals, we do not take into consideration his lack of background and experience.

The effect of traditional unit courses with goals set for the average student means that if the student comes into the course handicapped, or disadvantaged, by previous experiences, he is more likely to become more handicapped and negative. The bright student will loaf along without much challenge and perhaps develop negative attitudes towards the school. Every time we over-challenge a student to a point of discouragement, or under-challenge a student, we reinforce his negative concepts, and we provoke future failures. Why not devise a program that challenges each student to the same degree? I propose that we do a better job of identifying all the concepts, manipulative and cognitive, in each discipline. A program could then be developed to allow students to challenge any of these concepts and begin study in earnest where his level of ability lies. He could progress as rapidly and as far as he desires. The teacher would have to set minimum standards for credit in the course. This could be done in various ways. We could develop a flexible unit system. Instead of taking Woodworking I for one unit of credit, let the student enroll in Woodworking I for as much credit as he is able to perform in a certain period of time. A student would receive credit for that portion of the course which he performs well. Instead of giving a student a D for the full course, perhaps he has only reached the performance level of half the course, but he has done that portion of the course well. Why not give him an A or B credit for a half unit instead of a D for one unit? By using this type of a system, I believe that we would remove the stigma grades have for many of the students and give them, for the first time, a feeling of success as they achieve to their level of ability. In this type of concept, a teacher's role would be to determine the level of competence for a particular course or subject area. It would be his task to divide the course, or subject area, into units and tasks. He would develop his performance tasks in a particular course by assuming that a student was illiterate in that particular area. The tasks would then progress to the most complex that would be required for credit in that particular course. As complementary units are developed, we would determine which units may require prerequisite concepts to be learned. We should always have available the prerequisite material for the student to review as he attempts to progress through the course. After we have identified the individual units and concepts that are essential for the course, then the most difficult and the most important task is to develop a step-by-step procedure to accomplish the manipulative or cognitive task. At Brigham Young University, we have been experimenting with a program using black and white pictures and either a written or a taped instructional script which are organized into instructional packets that the student can work through at his own pace. After this type of program has been developed, the teacher needs to reorient himself and his role as a teacher. He now becomes a resource person.

I have been indirectly involved with a project designed to train some of the Navajo Indians of Southern Utah to become productive citizens in the state. The objective was to take adult Navajo Indians and make qualified, skill-oriented persons out of them. The part of the project I became involved in called for a full-time teacher of automotive trades. One was selected to teach these Indians the skills involved in the automotive trades. After only a few months, however, the teacher became very discouraged because he was unable to teach concepts at the Navajo level of understanding. The project was unable, or failed to produce skilled automotive personnel.

In contemplating the nature of the problems, I felt an extreme need to reach down to the cultural level of these Navajo people and present concepts at a level that would bring them to a step-by-step usable level of skill that would assist them in becoming self-sustaining.

At that same time, Dr. Dale Nish, a member of the industrial arts faculty at Brigham Young University, became involved in developing instructional materials of a basic nature for the Navajo Indians. Dr. Nish became engrossed in this project and conceived a program which would enable him to teach certain skills to these deprived people. We worked on the assumption that each individual should be allowed to reap maximum benefits from his working skills and knowledge as he enters into his planned course of study. We wanted each student to become involved in a quality intensive instructional program depending primarily on media and the initiative of the student. This meant that the program should be so designed as to allow students to progress at their own rate and achieve to the level mutually agreed upon by the teacher and student upon his entry into the probram.

One aim was to avoid penalizing the student who had achieved some skill and cognitive concepts before entering into the course; therefore, it was necessary to have a program that would permit a student to attain the same level of competency in less time than under the traditional program.

We desired to minimize overlap of instruction between courses (both informational and operational), and hoped to utilize some of our more advanced students as teaching assistants and give them the opportunity to be directly involved in the planning and production of an individualized type of instructional program. We wanted a program that would place the responsibility of learning on the student and would free the instructor to function more as a resource person and as a disseminator of information.

My first assignment was to identify the task required for the performance level a student would need to complete a unit of work—whether it be a unit of woodworking, a unit of automotive and power, or a unit of metalworking.

It was necessary to determine what was required for a person to be successful and able to utilize the units of the course and program they had chosen. As the units were identified, they were broken down into the various tasks that the student would have to master.

Following the identification of the tasks, the next step was to determine the level of performance required for each task. We then proceeded to develop step-by-step instructions using black and white still pictures to illustrate each step of the task to be performed. Included in the instructions was a written script, or tape, explaining the processes one must go through to complete each step. This was the heart of the whole program, because it required the instructor to completely analyze each instructional unit of the subject matter and break it down into minute tasks that fully explained each step to a student coming into the course, who, it was presumed, had no previous experience, background, or association with this particular unit of work. With each unit or task, a criterion test was developed to check on the performance level of the individual as he progressed through the program. The performance test was requested by the student as he felt he was ready to pass it. No undue pressure was exerted by the instructor other than the minimum requirements for the course. When a student entered into a course, he would be given the requirements he would need to receive full credit for the course, and possibly the requirements for the entire unit of coursework, which would include more than one unit. A student would then make a basic contract with the teacher as to what his level of accomplishment would he. The teacher would have a performance criterion to be met and passed by each student for a particular task. If the student failed to perform at the required level, he would return to the task and work until he felt he could challenge the test again.

As the student began his coursework, he would be permitted to start in any area that he desired as long as he passed the performance examinations on any prerequisite tasks. If he wanted to challenge a course, he would be able to start out and pass off those performance tests which were prepared for the performance tasks in a particular unit and move through the course with minimum delay. The student could challenge a criterion test whenever he felt that he had mastered the task, or if he already had acquired the skill before entering the course, and move through the course as rapidly as his ability or motivation warranted. If he didn't meet the performance criterion, he would then have to work on the task until he reached the required performance level.

As a student completed each basic task sequence, he would demonstrate his knowledge and skill through the criterion test for each task. The program would progress in the difficulty of tasks and the exactness of the performance levels to be achieved. When a particular task was judged essential to a future task, it would then be placed as a prerequisite task which had to be mastered before the more advanced task could be attempted.

A student entering this type of a program could start with the basic performance tasks and advance progressively to a higher level of task without the frustration of misunderstanding or the feeling that he is expected to have a knowledge and skill which he may not have, even though his school records may indicate that he has passed a course where this knowledge and skill was supposed to have been achieved.

To resolve many existing problems and make the learning experience more meaningful, I think that we have to develop instruction of task and cognitive concepts on a lower level in all subject matter. This could create an improved atmosphere for a positive relationship between the student and teacher.

A complete program in an area of industrial arts begins in junior high by identifying basic, minimal sequences leading to the future occupation. These programs continue in difficulty through high school and the junior college or trade school, until a student has gained sufficient skill and knowledge to live successfully in society.

As a student enters a college training program, particularly a teacher education program, a programmed series of this type would allow a student who had an excellent background development in his secondary school experience to take advantage of that background. He would not be required to repeat the performance tasks that he learned previous to his college career. He would only be required to demonstrate his skill and knowledge on the performance check sheets. A student could possibly get through two or three courses in a particular subject area in a fraction of the time normally required. We would have to change our present system of granting credit for a certain number of clock hours for lab and lecture.

In the words of Mr. DeLay and Mr. Nyberg, "We, too, want to individualize education, but even more we want to personalize it. We refuse to deal with 'the learning organism or human material;' we deal with little people and big people who care about each other and about learning. We trust that people will learn unless they are prevented from doing so. A child with a normal, healthy body cannot keep himself from learning to walk if the adults around have sense enough not to hobble him. From this point, we assume that a child will learn other new things naturally, by himself, asking the questions he needs. True, an adult should help show him the way and then get out of it. The aim of a good teacher is to become unnecessary. Not many of us can stand that kind of ego torpedo. That is one reason not many of us are good teachers."[3]

Let's organize ourselves to the point that we can act as resource people and be able to impart our knowledge and personal self to our students. Let us also assume all students to be culturally deprived, but allow them the chance to progress as rapidly as we can motivate their desire for more knowledge and skill.

FOOTNOTES

(1) Donald H. DeLay and David Nyberg, "If Your School Stinks, Cram It," Phi Delta Kappan, LI (February 1970), p. 310.

(2) Ralph Gallington, "The Disadvantaged Youth," Industrial Arts for Disadvantaged Youth, Nineteenth Yearbook of the American Council on Industrial Arts Teacher Education (Bloomington, Ill.: McKnight & McKnight Publishing Company, 1969), p. 14.

(3) DeLay, Phi Delta Kappan, p. 11.

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Humanism

Humanism and Industrial Arts

Howard S. Decker

The topic to be discussed here this morning is fundamental to human life in our democratic society. It revolves around the problems of living together in a social order with the least friction and the richest possible conservation and development of human powers. The industrial democracy in which we live is not the ultimate but is a means to that end. Our democratic society is true then not because it reflects some inviolate order of things but because of its practical results. However, a little less than 200 years after the establishment of this democracy, we, as a nation, appear to be on the verge of a complete social breakdown. To paraphrase a recent article in MAN/SOCIETY/TECHNOLOGY, the journal of this association:

> In spite of a quasi-successful quest for material gain, Americans have failed to demonstrate that they can create a humane social order. Technological waste poisons the environment, sensibilities are violated by the visual ugliness and emptiness of our communities. Racist hatreds erupt into social conflict and bitter differences over the extent of our involvement in unproductive foreign wars alienate our youth from their elders and from the society in general. Our drop-out rate is such that about half of all secondary students still choose to leave before completing high school. Dissatisfaction has spread beyond the inner-city, and in the suburbs there is a questioning of the middle class life styles; a far too great percentage of our young people are turning to escape through the drug culture and through other less obvious escape mechanisms in order to deny the values which we have set up for them. The question is being asked by many people in varying positions: "Can a technological democracy survive unless the human living in that democracy is able to achieve a sense of responsible participation and a degree of personal meaning under the conditions of this democratic society?" Many of our intellectuals have reached the conclusion that in order to make our present society more viable, a reordering of priorities is most essential.

In order to fully understand the magnitude of this proposition, let us take a few moments to examine the nature of the common man as he is represented in the American democratic tradition. Now the average man in America—and incidentally, he's the parent of most of the students which we have in our schools—has a philosophy of life that consists for the most part of conventional principles that are provided by his church, his political party, his colleagues in business and industry, and his neighbors. On the whole, he's mighty suspicious of ideas, especially if they are new. To him, thinking is irksome and largely unnecessary, since he finds that a judicious regard for what "they" say will solve most of his problems. The political demagogue and the professional reformer, in whose interest it is to study his idiosyncrasies, find that a skillful appeal to his prejudice or to his fixed ideas never fails to bring about a favorable response. On the whole, he prefers orthodoxy, loyalty to party, and the preservation of the profitable aspects of the status quo rather than the sacrifices necessary for social, religious, or economic betterment of his community. He's not without some redeeming qualities, however; he has simple but socially valuable virtues of honesty, patriotism, and sympathy. If he can't be depended on to start a reform, he at least can be organized to carry out that reform. He's a powerful figure in our culture and the final arbitor in literature, art, morals, and, of course, in education. In our field, the educational profession, he's the person who passes or doesn't pass the bond issue so necessary for our existence, who passes or doesn't pass the salary increase that provides us with our daily bread.

He's the person, in the final analysis, who is presenting us with the problems of teacher evaluation, planning, budgeting, and systems of constraints on what we would like to do with the public's money. Recently, the American judicial system has moved into territory normally reserved for the common man, and you can bet your life that the higher courts in the United States are about to be challenged on this presumption of power.

At present, we are undergoing a recurrence of the age-old problem of reconciling liberty and law, authority and freedom. In the field of education, this conflict has taken the form of a battle between the prescribers of educational doctrine for the good of the "student" or the disciplinary approach to subject matter and the more humanistic tradition of the common man and his children who are seeking something quite different from our public school program. The common man would very much like to return to the old order of things when children were sent to school to learn and to return to the home relatively happy, uncontaminated by either drugs or ideas. He'd like to return to an educational system where someone in the system takes a real interest in the development of his child and where the conditions in the classes produced an enthusiastic student not particularly interested in dropping out or, even worse, in attacking the system in which the parent has such a great stake.

I think it is equally evident that another value system in human terms exists concurrently in our nation. This value system is supported by intellectuals in law, jurisprudence, and education, as well as by the liberal press, and is generally abscribed to by our multitudinous social reformers and by our militant student and ethnic groups. This dichotomy has existed since the turn of the century and was probably best described by Harold Rugg over thirty years ago (see Figure 1).

Figure 1. HAROLD RUGG'S GREAT DICHOTOMY[1]

The Thing People	The Force People
Define the world in terms of substance—the Thing.	Define the world in terms of function—the relations between things.
Deny change, insist on status quo.	Accept the concept of change as fact; let their minds conclude what the facts of change conclude.
Are oriented in the historical past; force the present into its matrix.	Are oriented in the present situation, interpret the present as the product of the past.
See the living creature as additive mechanism.	See the living creature as integrated organism.
Express the surface shapes and contours of the things themselves. This is mechanism in human science; representation and photographic reproduction in the arts; memory, obedience, and giving-back-what-was-set-out-to-be-learned in education.	Express the forces, tensions, push-and-pull in the world; in painting, poetry, dance, theater, education, as well as in science and technology, these are relationships.
Think by comparing with norms—the averages of frequencies—in terms of rank order of size.	Think in terms of thorough study of integration of forces in an actual situation.
Psychology, sociology, esthetics, and ethics—all mechanistic, additive.	Psychology, sociology, esthetics, and ethics—all organic, integrative.
Find causes of behavior in neural connections, associations.	Find causes of behavior in psychic forces, energies.

One of the best formulations of an educational system designed for the uncommon man was placed on paper over a quarter century ago at Oswego State Teachers College, Oswego, New York, and is stated as follows.

THE LEARNING PROCESS[2]

1. In most schoolroom situations, the chief motive of the children's behavior and learning is their need for self-esteem and a feeling of personal adequacy.
2. Activities and techniques which result in success and an increased feeling of self-esteem will be repeated; activities which result in failure or humiliation are avoided.
3. When children are confronted with a situation where the old techniques for satisfying their need for self-respect or security are not appropriate they will, if ready, learn new techniques for mastering the situation and, if unready, will use or discover methods for escaping from it.

[1]Rugg, Harold, Foundations for American Education, World Book Company, 1947, p. 69.
[2]Adapted from "A Tentative Social Studies Program," Campus Elementary School, Oswego State Teachers College, Oswego, N.Y., 1945 (207).

4. Any child is ready to learn new techniques in situations which are not markedly different from situations he has already mastered. Any child is unready for situations which call for solutions quite unlike those he has already used and understood.

5. Attempts to teach children before they are ready are not only a waste of time but, by building up attitudes of avoidance, interfere with later learning.

6. Habit is not a cause of behavior. Acts and techniques are repeated only if they satisfy need. Habit is not the result of repetition but the result of success.

7. Repetition is not a cause of learning. It is true that some situations, such as those calling for the development of a new motor skill or a technique of solution completely new to the child, are ordinarily not solved at the first trial. In such circumstances, most children must find themselves in the problem situation many times before they can find an adequate method of dealing with it. However, repetition sought by the child because he wishes to solve the problem has a very different effect from repetition forced upon him by the teacher. If repetition is imposed by the teacher in such a manner that the child is unable to notice progress or feels that he is failing, the result is invariably the discovery of a technique of avoidance.

8. Since the purpose of the schools is to develop each child to maximum capacity as a productive and happy member of society, the real test of their success is not the degree to which the pupils can talk about desirable techniques or even the degree to which they are able to use them in school at the command of the teacher, but the degree to which they voluntarily use them in their daily life outside of school. In other words, the attitudes which are required along with subject matter may be even more important than the subject matter itself.

9. The learning of any skill or item of subject matter is accompanied by the formation of attitudes by the pupil toward the subject, toward school, toward his teachers in general, toward adults, toward society, and toward himself which may be desirable or undesirable. As a result, how subject matter is taught may be even more important than what is taught.

10. Skills are better retained and more often used if they are learned under conditions similar to those in which they will be used.

11. Subject matter must be presented in such a way that each child shall secure a feeling of pride and satisfaction through its mastery. This involves an awareness of individual differences among children, not only in ability but in past experiences and present personality. It involves pacing the work for the individual child, and it involves a wide and varied program of experiences in school so that each child will have an opportunity to feel successful in his work.

12. Since cooperation with others is a necessary feature of the work of all members of our society, it seems desirable to provide many experiences where success can be obtained only as the result of the joint efforts of a group of specialized individuals.

13. The ideal program would be one in which the pacing of experiences is so appropriate that no experience ever needs to be repeated. It is not likely that this ideal will ever be attained, but it is fair to assume that a program which requires large amounts of repetitive work is out of step with the normal development of the children and will result in techniques of avoidance rather than mastery. If a child fails to develop the desired attitude or skill as a result of an experience, it should be assumed that what is required is a different experience.

Perhaps one of the last to discover the dichotomy and the problems inherent in it was Alvin Toffler, who states the problem as:

Our psychologists and politicians alike are puzzled by the seemingly irrational resistance to change exhibited by certain individuals and groups. The corporation head who wants to reorganize a department, the educator who wants to introduce a new teaching method, the mayor who wants to achieve peaceful integration of the races in his city—all, at one time or another, face this blind resistance. Yet we know little about its sources. By the same token, why do some men hunger, even rage for change, doing all in their power to create it, while others flee from it? I not only found no ready answers to such questions, but discovered that we lack even an adequate theory of adaptation, without which it is extremely unlikely that we will ever find the answers.[1]

I trust that by this time I have adequately documented the problem in the dichotomy in human value systems within our society, and I ask that we turn our attention to the problems of industrial arts education as they reflect this basic dichotomy. I think it goes without saying that most of our college and university writers in the literature of industrial education have already chosen their role. Most are on the side of change; however, as industrial arts educators, we are continually faced with varying arguments as to the manner in which the change shall take place. Perhaps our subject area's most discerning change agent—the person who has pushed for dynamic change within our profession—has been Don Maley, and his most recent writings indicate a most sensitive analysis of the dimensions of this problem in industrial arts. Simply stated, his position can be summarized by the following quotation:

> Any program in education that is worth its inclusion must first be dedicated to the human component and the processes through which the organism grows, develops, and aspires to new growth and development. Fundamental to this proposition is the process of learning to learn, the constant stimulation of curiosity, and the strengthening of a positive self-concept, the broadening of experiences, and the development within each individual in those ways in which he may relate, as well as contribute to the world in which he lives.[2]

Much of our professionalism and the professionals who operate within it are much more conservative and have advanced by deed, if not by the verbalization of philosophy, a much more restricted view of the educational process in industrial arts education. As a generalization, I would class most industrial arts practitioners on the "thing" side of the dichotomy.

We have been much more concerned with our past and have made every attempt to adapt the present into our historical matrix. We have been conservative in our methodology; we have sought to develop normative behavior in our profession and, most assuredly, we have defined the world in terms of substance, the thing, the machine, the shop, and the way a thing is physically set up rather than in the way that it functions. We have catered to, and appeased, that segment of the dichotomy which is basically conservative or reactionary, and many of us have taken great pride in this. We like to feel as practitioners that we are on the side of "industry" and the middle class mores of our community—that we value conformity in the behavior of the working man and have laid great stress on punctuality and the personnel concept of the human endeavor. We cringe just a bit when we read material such as the following quotation from Paul Goodman:

> The job gives no identity at all; and finally even the class, "being a workingman," gives no solidarity—one might as well be paid for featherbedding or unemployment. Typically, it takes six weeks to break in an average worker, three weeks if the plant is highly automated, and this is on the basis of no prior training or schooling. And getting the job, especially for a poor youth who cannot look around, is not a matter of taste, choice, or background, but simply of making a living.
>
> Nevertheless, there is a great noise about the need for long years of schooling in order to fit into the economy. Youth are warned not to drop out of high school or they will not have the skills required for employment. I am afraid that for most poor youth and the jobs they will get, this is a hoax. The evident purpose of the schooling is baby-sitting and policing, during a period of excessive urbanization and youth unemployment. The only relevant skill that is taught in school is to be personnel: punctual and well-behaved. The "functional illiteracy" that is so much talked about has no relation to reading for truth, beauty, or citizenship, but is entirely training to read directions and be personnel. When there is no industry in which to be personnel, one becomes client-personnel of the professional-personnel.[3] (That means you're on welfare!)

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[1] Toffler, Alvin, "Future Shock", Bantam Books, Inc., N.Y., 1971 (p. 3).
[2] Industrial Arts and Space Age Technology, American Industrial Arts Association, 1971 (p. 59).
[3] Goodman, Paul, People or Personnel and Like a Conquered Province, Random House, Inc., N.Y., 1963 (p. 132).

And it is in this manner that the industrial arts profession has been for many years torn between the change-motivated ideals of its college-based writers and the secondary school-based teacher, and supervisors who hold quite different views of what is a humane education and a quitedifferent definition of what is humanism. If that, then, is the problem and the expression of the great dichotomy as it relates to our profession, then if I am to be of service to you this morning, I must offer some way out of the apparent dilemma. The remainder of this discourse will be concerned with the alleviation and, hopefully, at some future date, the elimination of the philosophic dichotomy which has largely immobilized the innovative function within the industrial arts profession. In talking about resolving these differences, it would seem logical to take a look at the two views of what education could be and draw from them common elements that are acceptable to both positions. And if I be honest, I must say that the list is neither long nor limited to our particular line of work. I believe that there are three educational principles upon which all segments of the American community can agree, regardless of whether one is a banker or a working man, a taxpayer or a welfare recipient, or a hippy or red-neck; these broad fundamentals of an educational system can provide the synthesizing basis for both a relevant school system and a relevant industrial arts program. They are:

1. The school and each classroom in it can help to provide each of the pupils enrolled in that school with a wide variety of experiences and the physical resources that will make it possible for teachers and students working together to discover relevant and effective solutions to present problems.

2. The school and, of course, the teachers involved in that school can help to provide an atmosphere of acceptance to the unique value system of each student so that he is ready to explore his local, regional, state, national, and international environment without undue fear and humiliation because of his economic background, ethnic group, racial inheritance, etc.

3. The school can act through its teacher representatives and invited guests to the school system as a respected representative of the adult society in which the student must eventually take his place; they shall represent that society in an honest and straightforward manner without guile and without hidden agendas that often antagonize significant groups of parents.

Let us take a few moments to examine each of the criteria in terms of our particular set of values within the industrial arts profession. First, the industrial arts laboratory is a rich source of visual, tactile, auditory, and olfactory experiences and an elaborate physical environment which can be used by each student in the school for the solution of his problems of development. The varied program of the convention which we are now attending provides a rich store of suggestions as to the kind of current problems to which this environment should be addressing itself. We have sections currently discussing such matters as the problems of pollution, of housing and transportation, of the depletion of natural resources, etc. These are very real problems to the youth of America, and if you've talked to your children recently, you know that they are quite concerned about these and other matters and are ready to work hard in the research and development of solutions to some of these problems at their present level of participation in our society. Not all students, however, are concerned about such earth-shattering, cosmic ideas; others have problems much more mundane and much more personal. The industrial arts laboratory is a rich source of solutions to these problems, also, ranging from improving status in the family unit to making a present for the latest girlfriend. Full utilization of our industrial arts facilities for the solution of the present and pressing problems of young people cannot be over-emphasized.

Second, the industrial arts laboratory, for many students, is the only place in our entire school system where some modicum of success can be achieved by large segments of our school population. We offer, for example, to the large bulk of our student population an area in which the non-reader can succeed, the marginal reader can excell. To remove this from the industrial arts environment would be courting disaster in terms of the self-esteem of these students. Nor is the atmosphere of acceptance and success limited to just the non-intellectual segment; because of the nature of the work possible in an industrial arts laboratory, any level of abstraction can be absorbed into the general curriculum matrix. Industrial arts can be taught to one group of students, be it a class or a section of a class, at a highly theoretical abstract level, while at the same time accommodation can be made for those not versed in the mystique of the cognitive domain.

On our third prescription for the humanist school, the industrial arts teacher has almost an unlimited opportunity to present to his students a persuasive human model of the adult world. I would repeat here statements which I have made at other times—that in speaking of the underprivileged, one of the duties of every school subject is to present underprivileged youth with success models drawn from the adult world which have to do with legal socially responsible activities rather than the activity of an anti-social or illegal composition which make up the world of the street. If we cannot provide this student with an acceptable, relevant social model, then he is confronted with the concept of success exemplified by the big car, the flashy girls, and the $150 alligator shoes of the pimp, the pusher, and the other assorted hustlers which make up the success model of the ghetto. In a like manner, the industrial arts laboratory can provide, both through the teacher and through an array of visitors from our industrial-business community, a real challenge to the exceptional student who wishes to climb the success ladder to the very top of a profession. The industrial arts laboratory, with its admittedly rather vague cooperation with the industrial environment, is uniquely capable of providing such liaisons.

This is, in a very general way, the parameter under which the industrial arts teacher can humanize his curriculum area. However, let's not stop with these rather vaguely worded generalities about our field; let's examine some specific facts which will tend to humanize the industrial arts curriculum. And here I shall list a succession of steps which I feel are important in this context.

1. The industrial arts teacher must become more conscious of human values beginning with the tools and machines which make up the industrial arts environment. When you leave this convention, I would appreciate it if each of you would take in hand each of the tools which you ask your students to use in the everyday construction activities in the laboratories. And if we're to be honest, we must say that many of these tools will feel both unfamiliar and uncomfortable in our hand. Let's take the lowly block plane, for example; if you look at it closely, you will see that the parallelism in the angularity between the bottom and sides of the plane has been generated by a machine tool which creates a relatively sharp edge at the top. Place it in your hand and think for a moment of the kids who are asked to use this tool day after day. Would it be more human, and would we not be adapting a machine to human needs better if these edges were rounded off? Take a file and round off the top edge of the block plane. Now again, place it in your hand. Feel better? Sure it does. A little grinding and polishing will improve the feel even more. Walk over to your tool panel—and I assume that in most laboratories such a tool panel is located in a central place—pick up the tool, go back to your work station. Need another tool? Walk back to the tool panel, and then ask yourself the following questions: Is all the walking necessary? Do you think that if you were a student taking woodworking, or whatever the subject matter happens to be, would you feel any human, personal, individualistic concern over the tools so located on the central panel? Such tools become anonymously dull and unuseable. Would it be better, perhaps more human, to assign at least a few tools to each student and let him develop some sort of an affinity for that tool, a motivation to keep it rust free, sharp, etc. And even consider for just a moment whether or not it was more human in this sense when the tools were hung on each individual bench in the days of manual training. Humanizing the physical environment in industrial arts is to consider each of the things we ask our pupils to do in light of the human factor involved.

By prescribing an atmosphere of acceptance and success, I do not necessarily mean that the child never fails in an industrial arts class. However, I am suggesting that perhaps in the industrial arts class diverse groups drawn from all segments of our school population can come together with some reasonable certainty that failure will not be part of the structure program of the class—that opportunity for success will be present for everyone, whether he be building a project or exploring the world of manufacturing or engaged in a research and development project; that within the confines of this curriculum area there is room for the diverse talent of all sorts of postures, philosophic and otherwise, within the school community; that as much as possible the true consequences of the student's behavior will be self-evaluating and will rise from the nature of the work rather than from some arbitrary evaluation system prescribed by the teacher; that every effort will be made to so structure the classroom environment that the normative behavior which binds and blinds the more academic portions of our secondary school curriculum will be broadened to make allowances for varied background of the students coming to the area. There is also the implication that, regardless of the sequential background of the student, there is a place for him to begin his industrial arts work without undue penalty. This has been part of a long tradition in our subject area—one which demands to be preserved.

I am saying here, also, that as a male figure the industrial arts teacher has a unique opportunity to be a friendly open representative of the adult society and that he has a unique opportunity to create an environment where students can relate to an adult male on a different and more human basis than is possible in the ordinary lecture-oriented classroom. As the industrial arts teacher moves about the classroom or laboratory, and as he works individually with his students on their problems, he becomes a catalyst; his course provides the opportunity to let students meet face to face with successful occupational models that are within the capability of the students to achieve. In other classes, various segments of the community are invited in; however, for most students, the persons invited are so far above their level of expectation that these visitors are treated as mere curiosities. The industrial arts teacher has the opportunity to provide a balance in the visitors to the school. Most of the guests who speak to students are drawn from a very narrow band of professional and business people who represent only a tiny fraction of the world of work.

I could name many other practices which deserve your scrutiny, including the "let's beat the kids out of the parking lot" syndrome, which really has to do with the human act of giving, and the spin the wheel "personnel" system, which places more value on chance than on human virtue.

To this point, I have avoided mentioning any particular industrial arts curriculum, for it is not my purpose here to present to you any unique computation of subject matter that seems to be more or less important at this time in the history of our profession. Rather, I have attempted to show you a positive step that any industrial teacher, regardless of whether he is teaching the very latest innovative curriculum or the traditional approach to industrial arts, can achieve tomorrow, next week, or next year in making his curriculum acceptable to all segments of our society by providing for those human values which are valued by both extremes—the conservative and liberal positions for our communities. If I am successful in my logic, then I think it would be possible for the industrial arts teacher to be acclaimed by all of the parents of any school. When parents receive positive feedback and when parents see their son's or daughter's greater degree of self-esteem, then they can endorse any type of curriculum structure within the industrial arts laboratory. My basic point of view is that parents and students are not so much concerned with what is taught in industrial arts as with how industrial arts is taught, and how industrial arts is taught has to do with the feelings of each of the pupils as they relate to the teacher, the physical environment, and the social environment within the industrial arts classroom. If industrial arts is to attract even greater numbers in the future, it will do so not through violent change in curriculum goals but in the manner in which young people are treated in the industrial arts laboratory. How they are treated is concerned with the opportunities for self-enhancement that are present in that laboratory. I sincerely believe that the humanization of the industrial arts curriculum and the industrial arts laboratory is essential if we are to survive the increasing reluctance of the American taxpayer-parent to support an educational system which he feels has become so depersonalized that no longer is there anything in it for his kid.

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Instructional Technology

Instruction with the Audio-Tutorial System

Maurice D. Ingram

The audio-tutorial instructional system is a unique method of providing individualized instruction by utilizing audio tape. It was developed by Dr. Samuel Postlethwait at Purdue University to teach botany. Dr. Postlethwait originally used taped lessons in an effort to help students with weak educational backgrounds. Progressive steps in development led to the use of self-contained lab sessions centered around the tape system supported by visual, written, and experimental materials.

The audio-tutorial system can be used to teach a variety of subjects. This report is based on personal experience, as a lab instructor, using the audio-tutorial system to teach basic electronics at Texas A&M University. In this lab, the audio-tutorial recorder and all required test equipment such as meters, generators, power supplies, etc., are mounted in the walls of a study booth. They are conveniently located with respect to the work space and the student. All instructional supplies are located in drawers within each booth.

Students arrive at the lab at their scheduled time. They pick up lab assignment sheets and headphones and proceed to their assigned booth. The student is dependent on the recorder for instructions and information needed to complete his experiments. It is obvious that the success and quality of instruction is solely dependent on the planning and effort incorporated into the tape and accompanying materials.

The recorder used with the audio-tutorial system has all the features of regular recorders, plus a "pause" control and two "backspace" controls. The "pause" control makes it convenient for the student to stop and start the tape for short periods of time while completing his experiment. The "backspace" control makes it easy for the student to repeat portions of the lesson. An auxilliary knee switch is also provided for backspacing.

It is recommended that the tapes be recorded by the same person teaching the lecture portion of the course. Recorded tapes often start with a statement of objectives for the lesson, followed by a brief review of the previous lesson. Step-by-step instructions are given to the student, accompanied with supplementary information. It is desirable that all of the students' procedural questions are answered by the tape. Summarizing at the end of the tape is advisable. A lab instructor should be available to provide extra help when necessary.

Designing effective laboratory experiences and accompanying tapes is a full-time job. Improvements can be made each time a course is taught. It is advisable to devote some time each week to obtaining feedback from students about the previous lab session.

It has been stated that the audio-tutorial system is an impersonal method of teaching. Students spend three hours per week in the classroom with the instructor and hear his voice on the tape. Students can seek additional assistance from the instructor or the lab assistant.

Does the audio-tutorial lab cost more than the conventional lab? The only additional equipment required is the recorder. Fewer lab positions are required as a result of flexible scheduling with the audio-tutorial system. With the increased efficiency gained by the audio-tutorial system, it may very well be less expensive.

There are a number of advantages associated with the audio-tutorial system. Flexibility in scheduling allows the student more freedom in selecting his lab time and make-up time. Old lab sessions may be reviewed conveniently. A student may progress at his own rate of learning. The isolation afforded by individualized booths allows maximum concentration, while placing the burden of learning directly on the student. Individual help can be given without holding back the class. Students are less dependent on the "buddy system," as compared to the conventional lab.

How does the audio-tutorial system compare with the conventional method of lab instruction? Dr. James Boone, who installed the audio-tutorial system at Texas A&M University, has stated: "The electronics students have achieved higher grades and have progressed through the course material faster than during the previous year when conventional methods were used. Furthermore, each student has become skilled in the use of electronic measuring instruments...."

Mr. Ingram teaches in the El Paso Public Schools, El Paso, Texas.

Simulation vs. Autotutorial Instructional Systems

M. James Bensen

Industrial arts education has been actively involved in both of these learning activities for a long time. If we accept the definition of autotutorial as being "self-instructional," then learning via the "book approach" would fit this description. The utilization, however, of sophisticated audio-visual hardware along with the appropriate software puts us just on the threshold of unlimited possibilities in learning.

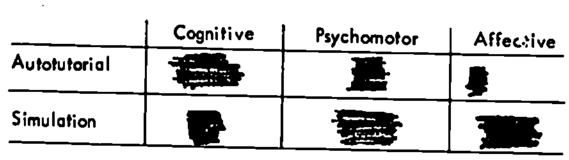
Simulation, too, in its broad sense would fit the description of almost all of the light-weight machines and equipment in our industrial arts laboratory.

In the arena of basic learning in the cognitive and psychomotor domains of educational objectives, it would appear that the autotutorial systems approach would be extremely effective.

Though presently the autotutorial system is a very rigid and highly structured approach to learning, it does not necessarily need to remain in this posture. We find that the behavioristic sequence based upon the Skinner principles produces outcomes from the learning environment that are quite predictable and accurate.

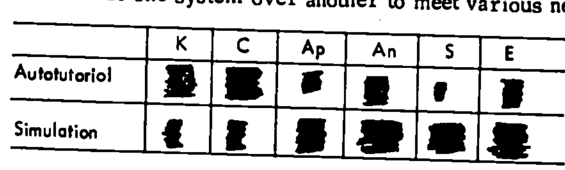
The simulation approach has many applications in the contemporary industrial arts laboratory. A high percentage of our shaping and forming machines are actually simulators or light-weight versions of the heavy-duty machinery found in industry. As industry becomes more and more sophisticated, we will find ourselves involved in increasingly numerous new simulation activities.

If we examine the three domains of educational objectives within the context of autotutorial systems and the simulation approach, we find that learning can very appropriately take place in both approaches.



The shaded areas in the above matrix would indicate, however, that simulation has more potential impact in the behavioral changes of the affective nature.

Further examination in the cognitive domain would lead us to draw more conclusions as to the possible selection of one system over another to meet various needs.



Outcomes of these ratios would especially be true if we took into account the heavy involvement in executive levels of management in industry. An offshoot of this is indicated in the booming development of educational games to teach people to function at the decision-making level.

As we look to the future, we can expect vast improvements in both of these educational endeavors.

With the development of new and exciting software, coupled with creative applications and mixes of hardware, we will make the current scene look like the little red school house when compared to today's state of the art.

We have the technology, but we must find improvement in the retrieval and management systems that will aid us in utilization. There are exciting times ahead, and we are fortunate to be able to participate in it.

Mr. Bensen teaches at Stout State University, Menomonie, Wisconsin.

Developing Inexpensive Audio-Visuals for Industrial Arts Programs

Lee Carter

The senses are the "highways" into the mind, and efficient teaching depends upon the use of these senses. A recent survey indicated that the students we presently have graduating from our schools of secondary learning view approximately 18,000 hours of television before high school graduation, yet many times we put them in a room or laboratory with four bare walls and wonder why they are not interested. A great deal of instruction in classrooms, as well as industrial arts laboratories, is carried on verbally without any attempt at using the other senses which constitute major entrances into the mind. The use of instructional aids can do much to develop interest and motivation within an industrial arts program.

The following percentages have been determined regarding how much a student remembers in relationship to the techniques of learning applied.

Students will remember about 10% of what they read.
Students will remember about 20% of what they hear.
Students will remember about 30% of what they see.
Students will remember about 50% of what they see and hear.
Students will remember about 70% of what they say as they see.
Students will remember about 90% of what they say as they do!

A teaching aid is a device or material that also aids an instructor in his presentation of a subject or a specific lesson. A teaching aid can assist an instructor in helping him transmit his ideas or concepts more effectively than a verbal presentation only. In industrial arts, teaching aids can be a very valuable asset to an instructor in his instructional program.

An instructional aid should be a means to an end, but not the end itself. Sometimes an instructor will rely on an aid so much that he misses the main thought or theme of his presentation due to getting so involved with the teaching aid. Any type of teaching aid should only be used to enhance or help clarify a concept, technique, etc.

Audio-visual materials are tools to increase the effectiveness of learning. They help the pupils to assimilate and communicate ideas in a more meaningful way. They provide a systematic growth of knowledge and skills, attitudes and appreciations that lead to the development of well-rounded, well-coordinated, and enriched personalities. The proper use of audio-visual materials will help to reach these objectives when the instructor selects the right aid for a particular need, plans for definite knowledge and attitudes to be gained from the use of the selected aids, and provides for sufficient pupil participation to make the use of the aid valuable to the pupil.

Visual aids should include all types that can be used in the teaching professions. They need not be costly to have value as teaching aids. Surprisingly, many of our most effective aids to learning are inexpensive and free. Aids of some type or classification are available to every school, regardless of its location or the wealth of the community.

Teaching aids can generally be divided into four broad categories. They are:

a. Synthetic or 3-Dimensional Teaching Aids which appeal to the touch. Models (enlarged or miniature, working or stationary), actual objects, cutaways, mock-ups, dioramas, and display boards are only a few A-V aids that would fall into this category.
b. Visual teaching aids which appeal mainly to sight include such aids as posters, chalkboards, felt boards, bulletin boards, hook-loop board, filmstrips, diagrams, graphs, charts, flat pictures, the overhead projector, slides, demonstrations, and magnetic boards.
c. Audio-visual teaching aids appeal to both the sight and hearing. Motion pictures, field trips, dramatizations, and puppets are excellent examples of this area.
d. Auditory teaching aids which consist generally of tape, records, and radio programs appeal to the hearing sense.

Once the instructor has determined the best possible type of A-V aid to use which will meet the desired objectives in terms of students' needs, interests, and abilities, he should develop the instructional aid to include as many of the following characteristics as possible:

Aid should be appropriate and geared to the students' educational level.

Aid should be easy to use and simple in construction, so no loss of time is required in setting it up or taking it down.

Aid should be kept current, attractive, and useful at all times.

Aid must be accurate, so it presents a clear and concise impression.

Aid should express simplicity and project only one main idea or concept at a time.

Aid should involve color and texture which will add greatly to the quality and appearance of the teaching device.

Aid should be readily adaptable for change at will. Many times it is necessary to modify, change, or update an aid, thus requiring flexibility in design.

For my presentation today, I would like to confine my remarks and demonstrations to the two basic A-V aid categories of 3-dimensional teaching aids and visual teaching aids. Many very effective aids can be constructed by any industrial arts instructor which will encompass one or both of these categories. I would like to divide the rest of my time into the following areas: "Making Inexpensive Color Overhead Transparencies," "Simplified Method of Finding Magazines and Booklets," "Unique Techniques for Bulletin Boards and Constructing 3-D Bulletin Board Letters," "Inexpensive Classroom Display Racks and Other Devices," and "Unusual Methods for Mounting Flat Pictures, Charts, Graphs, Etc."

COLOR-LIFT TRANSPARENCIES

The color-lift process of making transparencies involves the actual transferring of a picture, color or black and white, from a printed page to a transparent medium suitable for projecting on an overhead projector. These lifts may also be mounted for display on windows, light boxes, lamp shades, and other back-lighted media.

Several methods may be used in producing a lift transparency; they differ from one another primarily in the method of laminating a transparent film to the ink of a picture. The steps which follow the lamination process are basically the same for all methods.

The process described here involves the use of Con-Tact Brand Transparent Shelving Paper readily available in hardware, houseware, and variety stores. It is available in rolls 18 inches wide and sells for about fifty cents per yard, making the cost of an 8 x 10 inch lift approximately six cents. The backing paper is ruled along the edges and marked in square inches, which facilitates handling and cutting. The transparent material appears to be a mylar film with a matt-type surface and backed with a strong contact adhesive. It is an excellent medium to use in laminating pictures, book covers, cards, and other flat materials for which protection and preservation is desired. Because of the nature of the adhesive backing on the Con-Tact film, the time-consuming procedure of drying the wet film in the usual lift process can be entirely eliminated.

Before making a lift transparency from a picture, it would be well to consider the particular objectives that this picture will serve. Perhaps it would be more advantageous to dry mount the picture for displaying and student handling. Perhaps it should be left in its context in the magazine and projected for class viewing with an opaque projector. Perhaps a 2 x 2 slide reproduction would be more desirable. Whatever the medium of utilizing the picture, one should be aware of any copyright restrictions involved. The "Fair-Use" clause in copyright legislation should permit the making and using of a lift transparency in an instructional situation.

It would be well to keep in mind that the lift process is a pass or fail procedure, and if the transfer is not successful, the picture cannot be salvaged for a second attempt. In becoming familiar with the techniques involved, it might be wise to experiment with dispensable pictures.

Testing for Suitability

The lift process is restricted to printing appearing on clay-coated papers. The clay coating may be detected by briskly rubbing a moistened finger over an unprinted area of the paper. A white, chalky residue appearing on the finger tip is indication that the paper has a clay coating and is suitable for a transfer. Among the magazines from which successful picture transfers have been made are: BETTER HOMES AND GARDENS, LIFE, LOOK, NATIONAL GEOGRAPHIC, NEWSWEEK, TIME, SPORTS ILLUSTRATED, SUNSET, POPULAR PHOTOGRAPHY, and other magazines of similar paper quality. A glossy finish on a paper is usually an indication of a clay coating. The more recent the printing of a picture, the easier it is to separate the ink from the paper. A magazine several years old may require considerably more soaking and rubbing to separate the ink from the paper.

Laminating Film to Picture

Cut a section of the Con-Tact film the same size or slightly larger than the picture that you wish to transfer. Make sure that the picture is in good condition, as dirt, wrinkles, and creases will cause inferior quality transparencies. It is usually advantageous to remove the page from the magazine without trimming the picture and to place it upon a smooth, soft surface such as on top of a magazine.

Carefully peel back about an inch of Con-Tact film from its backing paper and apply it to the appropriate edge of the picture. Before exposing any more adhesive, exert pressure with a finger along the edge that has contacted the picture, making sure that wrinkles are removed and a firm contact has been made. With one hand, slowly peel off the remaining backing paper, allowing the adhesive to contact the picture simultaneously. The other hand should be exerting slight back pressure to the picture, taking care to keep it smooth and flat. For small pictures, the Con-Tact film can be completely removed from its backing paper before applying the adhesive to the picture. A tool such as a small roller, a small glass jar, or the back of a comb may now be used to smooth the film, working from the center out. By careful rubbing, most air bubbles will disappear, but if you find it impossible to remove an air bubble, try pricking it with a pin from the reverse side of the paper. A warm iron, about 200° F., applied with firm pressure over a clean slip sheet will greatly enhance a thorough lamination. If, under close examination, dull spots are visible under the Con-Tact film, additional ironing is necessary. When the lamination is complete, the picture may be trimmed to desired size. A picture on the reverse side of the sheet of paper may also be laminated for a lift transparency at this time.

Separating Paper from Ink

Submerge the laminated picture in warm water until the paper is thoroughly soaked and the laminated ink can be peeled off. This soaking time will vary from a few seconds to several minutes, depending upon the thickness and consistency of the paper stock. The cover of the magazine will take considerably longer than a thin page. A little detergent added to the water may hasten the procedure. After the paper has been removed, a clay residue will remain on the picture which must be removed by rubbing with your fingers, a soft sponge or wet cotton. This residue may be almost invisible when wet, so be sure to rub all areas of the picture. After rinsing in clear water, inspect the lift carefully under strong light to see if any clay residue remains. If any residue remains, continue rubbing until the lift is clear. Care should be taken in rubbing, so that the ink is not scratched by fingernails or abrasive materials.

Clearing the Transparency

Although the transfer may appear quite translucent when wet, it will become dull upon drying because of the porosity of the ink and the adhesive. This porous surface must be transparentized or cleared for the most effective projection. Usually it is recommended to thoroughly dry the transparency and then apply a clear spray or coat with a waxy film such as with the applicator which is used on black and white Poloroid film. A more effective and less time-consuming method possible with the Con-Tact film is to apply the adhesive side of the lift while as wet as possible to a sheet of clear acetate film. Most types of inexpensive acetate film may be used, as long as it is clean and free of any oil coating. The adhesive action of the Con-Tact film is neutralized while wet, and the transfer film may be peeled back and re-applied if necessary after it contacts the clear acetate. After positioning on the clear acetate, the lift should be smoothed with a sponge, paper toweling, or a cloth in order to remove as much water as possible between the layers. A roller may also be used at this time to assist in bonding and to remove remaining water. Good projection is possible immediately, but the transparency will usually improve after several hours because minute particles of water still remain, creating a fog that will clear when dried.

Lift transparencies are adaptable for a variety of purposes and limited only by the resourcefulness and imagination of the user. One interesting technique with black and white lifts is to use them as diazo masters for producing excellent tonal quality transparencies in various colors. Remember that a transparency can be no better than the original. Making top quality lift transparencies will take practice and requires clean and careful work. The color-lift process has its limitations, but it can be a valuable and rewarding medium.

SIMPLIFIED TECHNIQUE FOR BINDING MAGAZINES, BOOKLETS, PAMPHLETS, ETC.

Every industrial arts instructor at the elementary, junior, or senior high school level generally is a subscriber to a number of professional and non-professional periodicals, magazines, and booklets of various types which he uses in his industrial arts program many times throughout the school year. To prevent undue wear, many instructors have bound their magazines together by the year, volume, or quarter, thus providing their students and fellow faculty members with a readily-condensed reference source that will last for many years to come.

There are many different methods used today for binding printed material. Some of these methods include saddle stitch, binding post, loose-leaf, case bound, mechanical plastic binding, and ring binder loose-leaf. The method described below is a combination of padding and case binding.

Tools and Materials

1. A set of parallel clamps (can easily be made at home)
2. Small roll of cord or heavy twine
3. "Book-Saver" adhesive
4. Roll of 3-inch Mystic Tape
5. Hand or power saw
6. File folder
7. Masking tape
8. Stapler
9. Magazines
10. Sharp knife

Procedure for Binding Magazines

1. Select desired magazines to be bound and clamp them in set of parallel clamps. Be sure all magazines are flush on edge being bound.
2. Using either a circular saw or hand saw, make sufficient number of cuts 1/8 inch in depth and spaced approximately 2 inches apart on the bound edge of the magazines.
3. While magazines are still clamped, cut required number of pieces of cord to proper length and glue in each saw kerf with "Book-Saver" adhesive. If desired, the adhesive can be applied the entire length of the bound magazines.
4. IMPORTANT: Allow bound volume to dry while still in the clamps. Trim off any pieces of cord that extend beyond edge of the magazines with a sharp knife.

Procedure for Binding Individual Articles

1. Select magazine article to be bound and trim to selected size. If article is going to receive rather heavy use, it is desirable to seal-laminate the article before proceeding to bind it.
2. Obtain a standard 11 pt. manila file folder, letter size, and insert magazine article in folder as it would be if being permanently filed.
3. With article properly inserted in folder, staple in three places along folded edge of the manila folder.
4. Using 3/4-inch masking tape, cover the entire length of the stapled edge of the file folder, allowing 3/8-inch of the tape on front and back side of the folder. Be sure all staples are sealed by the masking tape, thus preventing the staples from snagging other material.

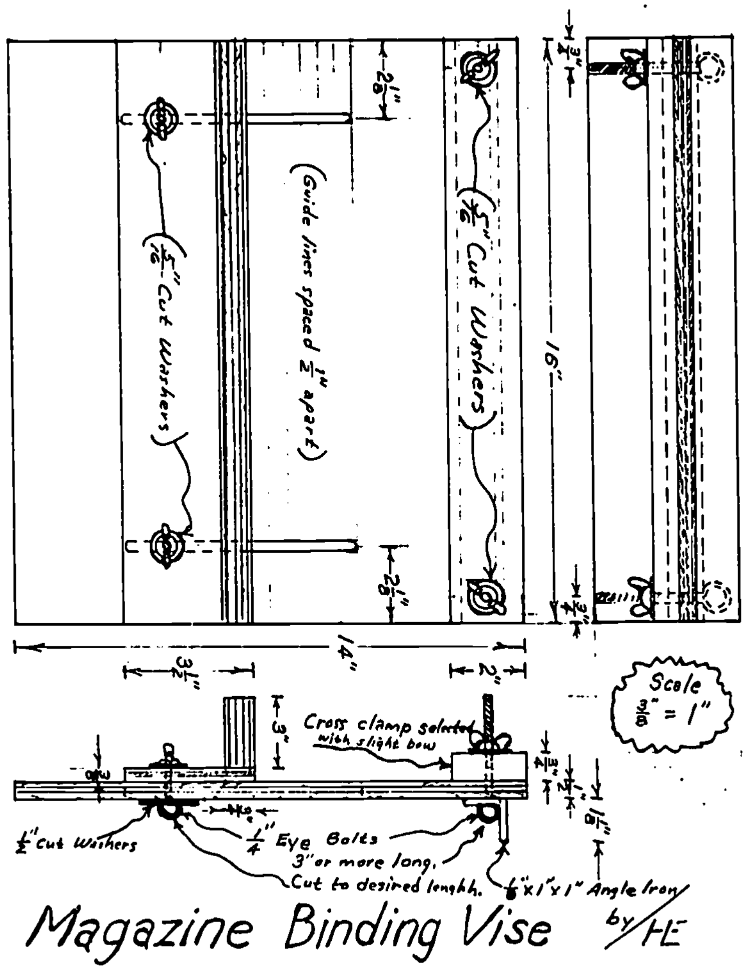


Figure 1

Figure 1 is a drawing of a magazine binding jig that was designed, drawn, and constructed by Mr. Hubert Ludden, industrial arts instructor from Glenns Ferry, Idaho. I believe you will find this to be a very practical and useful binding jig. Note the adjustable shelf that will adjust easily to various sizes of magazines.

Bill of Materials

No.	Part Name	Size	Type of Stock
4	Wing Nuts	1/4"	Mild Steel
4	Eye Bolts	1/4" x 3"	Mild Steel
4	Cut Washers	5/16"	Mild Steel
2	Cut Washers	1/2"	Mild Steel
1	Back Brace	1/8" x 1" x 1"	Angle Iron 16" long
	(Brace may also be screwed to back - Brace is optional)		
1	Shelf Back	3/8" x 3-1/2" x 16"	Fir Plywood
1	Shelf	3/4" x 3" x 16"	Fir Plywood
1	Cross Clamp	3/4" x 2" x 16"	Birch or Hardwood
1	Back	1/2" x 14" x 16"	Fir Plywood

The following are the step-by-step procedures for construction of the binding jig.

1. Cut back out of 3/4 inch plywood to size 3/4 x 14 x 16 inch fir plywood (if 1/2 inch plywood is used for back angle, iron brace 1/8 x 1 x 1 inch should be used).
2. Lay out, drill, and cut slots 5/16 inch wide in back.
3. Cut and assemble shelf and shelf back. Glue and nail shelf assembly together.
4. Drill 5/16 inch hole in shelf assembly as indicated on drawing.
5. Lay out and cut cross clamp to required size. (Due to the pressure this clamp will receive, it is recommended it be made from a hardwood.)
6. Drill 5/16 inch hole in cross clamp.
7. If one desires, the top of the cross brace may be marked with guides for ease of spacing saw cuts in backs of magazines.
8. Guide lines on the face of the plywood back can also be laid out so the shelf can be aligned readily.
9. If one desires, any suitable finish can be applied to the magazine binding vise.

UNIQUE TECHNIQUES FOR CONSTRUCTING 3-DIMENSIONAL BULLETIN BOARD LETTERING

A bulletin board can be a very effective teaching tool if the material is displayed well and rotated often. To make an unusual and striking bulletin board, 3-D lettering can be used to emphasize the main message and add much to the over-all display.

The following types of lettering can be made very inexpensively in an industrial arts laboratory with the very minimum amount of tools and equipment.

Demonstrations of each of the following processes will be given.

--Pin Back Metal Letters—made from type metal.
--Water-Soluble Liquid Polyester Casting Plastic.
--Waterblown Urethane Foam Letters.
--Other 3-D Lettering—Styrofoam, Leather, Cardboard. Note sample display board.

WATER-SOLUBLE LIQUID POLYESTER CASTING PLASTIC LETTERS

Tools and Materials

1. "Water-Mix" Casting Plastic
2. Catalyst
3. Mold (letter mold, etc.)
4. 1/4-inch Electric Drill
5. Paint mixing rod or part of an electric beater
6. Water
7. Measuring cups
8. Mylar
9. Mixing containers—3 (such as rubber or plastic bucket)

Procedure

A. Determining the amount of plastic needed.
   1. Determine the amount of plastic required to fill your mold. One easy way of doing this is to fill the mold with water and empty contents into a graduate or measuring glass. This will give you the volume of liquid needed.
   2. Take the same volume of casting plastic.

B. Mixing the water-mix casting plastic.
   1. After determining the total ounces of emulsion (mixture of wonder cast and water) needed, measure out half this total in casting plastic and half of this total in water. Do this in separate containers.
   2. Pre-measure the catalyst needed and set it to one side. Measure out 9 drops of catalyst for each ounce of "water-mix" casting plastic you will use.
   3. For the best results, the mixing should be done with a paint mixing rod attached to a 1/4-inch high speed drill. A regular hand egg beater may be used, but this requires two persons and will not always give the best results.

C. Preparing the mold
   1. Before the mixed casting plastic can be poured into the mold, be sure the mold is clean of dirt, wax, grease, etc.
   2. Slowly (a few drops at a time) add the water to the "water-mix" casting plastic while using the mixer.

3. As the water is completely absorbed, more may be added. THE RATE OF ADDITION IS EXTREMELY IMPORTANT. Do not add water faster than it can be absorbed into the mixture.
4. When mixture is complete (it should form a creamy solution about like pancake batter), add the catalyst. Be sure that the catalyst is thoroughly mixed into the emulsion.

D. Pouring the plastic into the mold
   1. Pour mixture very carefully into mold. Avoid "lapping" the mixture, as this will tend to trap air.
   2. When pouring is completed, gently vibrate mold to bring air pockets to the surface.

E. Hardening and removing the casting from the mold
   1. For best results, the casting should be removed from the mold as soon as it has jelled.
   2. The casting in its jelled state should be placed on a sheet of Mylar to dry.

F. Sanding and finishing the casting
   1. Once the casting has hardened, it may be filed, sanded, carved, etc.
   2. Surface differences of color will appear due to the nature of the emulsion. This does not affect the quality or decorative ability of the casting.
   3. For best results, use paints, Rub-N-Buff, and stains to decorate the surface of the casting.

INEXPENSIVE CLASSROOM DISPLAY RACKS AND DEVICES

Slanting Lecture Stand and Rack
Unique Type of Easels—Large, Medium, and Small
Wire Display Stands—Various Styles
Collapsible Book Rack
Portable "L" Shaped Rack—Variations
Chart Rack
Portable Accordion Portfolio and Permanent Portfolio
Series of Pull Shades with Charts Mounted on these

MOUNTING PICTURES, CHARTS, ETC.

Mounting with hand iron and dry mount paper
Mounting with rubber cement—one side temporary, two sides permanent
Mounting with Spray Deft or spray lacquer
Mounting with dry mount press paper and applying seal
Sealing picture with contact paper
Mounting with wallpaper paste
Mounting with spray adhesive
- Scotch Spray 88
- Scotch Spray 77
- Repositioning Spray
- Styrofoam Spray

Gummed Tab Hangers
Bulletin Board—Dry Stik Wax
Mystic Tape Hinge
Double Back Tape

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Auto-Tutorial Instructional Systems

Alvin E. Rudisill

The auto-tutorial instructional systems described in this article are unique because they were developed by undergraduate industrial technology students at the University of North Dakota during the spring semester of the 1970-71 academic year. The thirty undergraduate students were divided into six research and development teams working closely with educational psychologists, instructional system specialists, university faculty specialists in the various areas of technology, two junior high school instructors, and eighteen junior high school students.

The total project from design, development, testing, and system evaluation lasted 16 weeks. Six students devoted full time to the project during the 16 weeks while the other 24 students devoted approximately one-fourth of their academic load and efforts toward the project. Regularly scheduled meetings of the total project team were held daily, but the majority of student efforts were devoted to five-man research teams which were charged with developing the individualized learning modules making up the total system.

During the first formal class period, the 30 students were given the responsibility of developing a six-week or 30-hour junior high school instructional system designed to cover the area of industrial energy systems. The following guidelines and/or limitations were placed on the project:

1. Total project design and development must be completed during the first ten weeks of the semester, with testing of the system in the public junior high school scheduled for the last six weeks.
2. The components of the system must be completely auto-tutorial, since the junior high school system was on a flexible modular schedule.

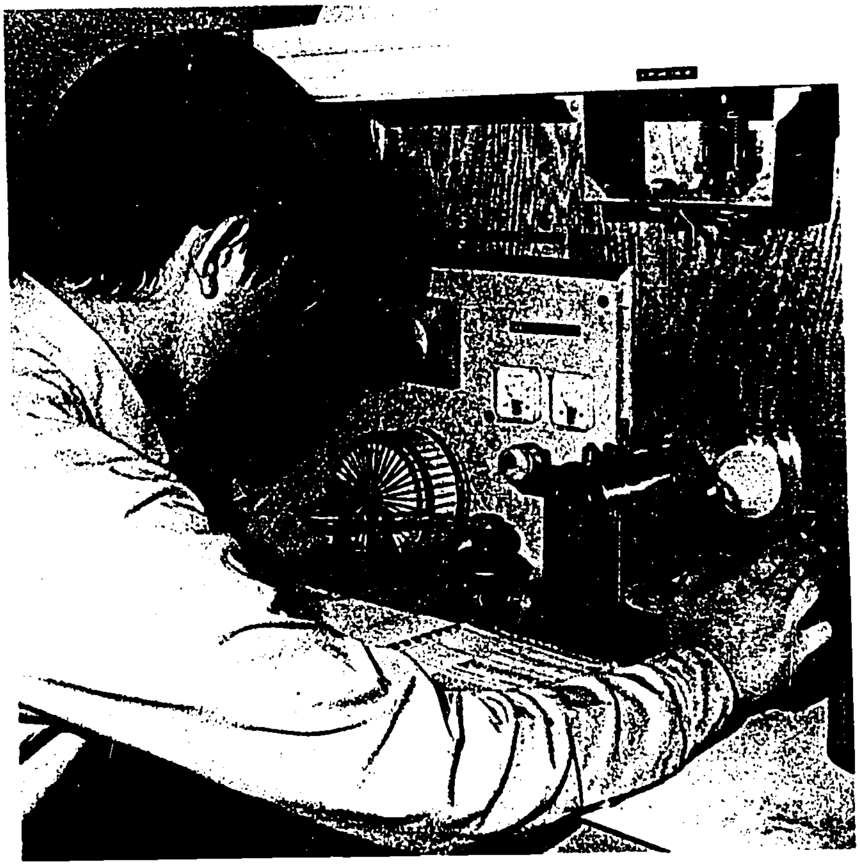

Figure 1. The Industrial Heat Energy System module included experiments on a thermo-electric generator, spot welding, heat engines, steam engines, the green house effect and measurement of heat energy with a thermocouple.

3. Each component of the system must be a self-contained unit complete with software and hardware.
4. The content in each component of the system shall be based on appropriate behavioral objectives, and these objectives must relate directly to the evaluative instruments.
5. The content in each component of the system must be competency-based and self-pacing.
6. A programmed learning format with small frames of information, active responding, and immediate feedback must be utilized.
7. Each instructional module in the system must be portable, self-contained, and able to be secured by locking.
8. All laboratory experiments must have both written and pictorial instructions.
9. All laboratory equipment must be mounted in appropriate hangers and both the equipment and hanger labeled.
10. A supply of all consumable materials must be maintained in each module.
11. The project budget is to be limited to $800 in actual expenditure but students should not consider donations of materials or equipment as an expenditure.

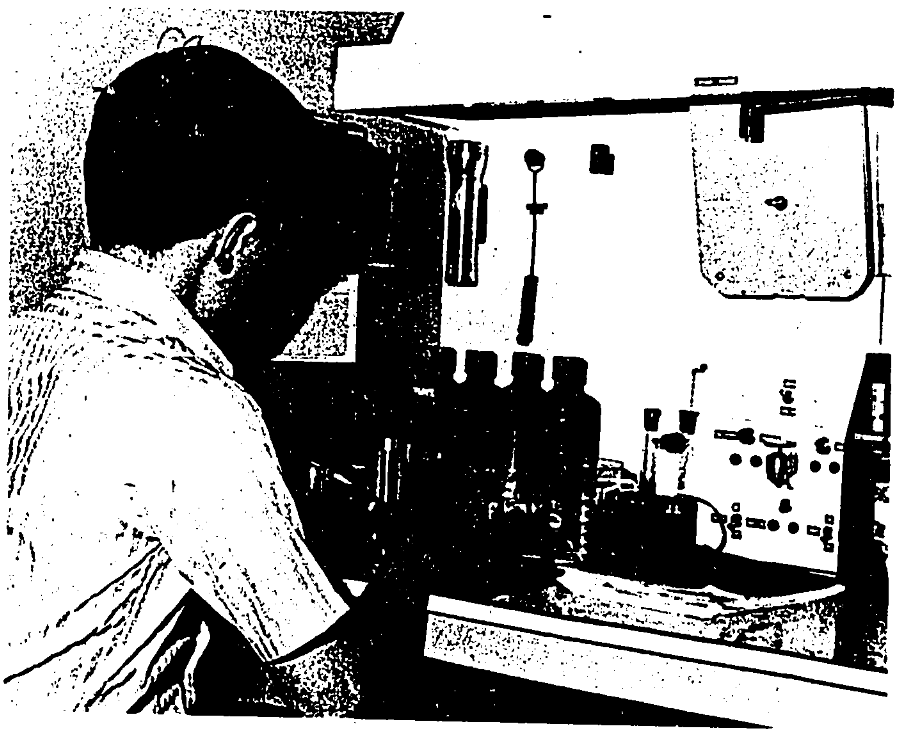

Figure 2. One of the most exciting units in the Industrial Chemical Energy System module was the static testing of a solid fuel rocket engine.

The primary purpose of the project was to provide undergraduate students with a knowledge of all the various aspects of instructional systems through direct involvement in system design, development, and testing. The student involvement with educational psychologists, junior high school students and teachers, and instructional system specialists during the design, development, and testing stages of the project made valuable contributions to the learning experience.

The development of the project evolved from the early frustrations of organizational meetings, through early inexperienced efforts at selection of content structure, emotional discussions relating to module design, late-night and week-end efforts to meet project deadlines, research team excitement during initial testing of programs and experiments with individual junior high school students, and finally, the pride and sense of accomplishment of each undergraduate student when educators, psychologists, junior high school students, and members of the school board praised the professional results achieved in such a short span of time.

The research and development teams complied with all the guidelines and/or limitations imposed on them at the start of the project. The actual value of the materials, equipment and supplies utilized in the project was $1,500, with $700 worth of equipment and materials donated by industry, educational organizations, and civil defense units.

The project team selected the following major areas of content within the total theme of "Industrial Energy Systems":

1. Industrial Electrical Energy Systems
2. Industrial Chemical Energy Systems
3. Industrial Mechanical Energy Systems
4. Industrial Nuclear Energy Systems
5. Industrial Heat Energy Systems
6. Industrial Light Energy Systems

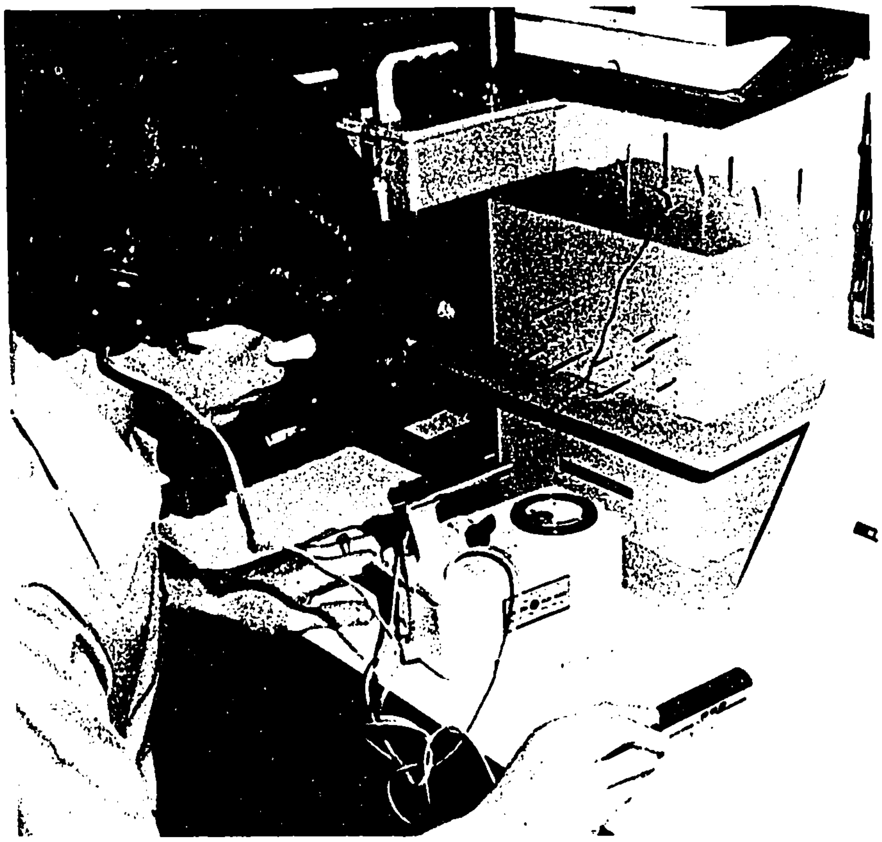

Figure 3. The Industrial Nuclear Energy System module involved students with measuring radioactivity with a Geiger counter donated by the local Civil Defense unit.

Each major area of content became the central focus in individualized module development. Instruction in each module was to average five hours of actual student effort. In actual practice, the instructional time varied from three to eight hours because each unit was competency-based and self-pacing.

INDUSTRIAL ELECTRICAL ENERGY SYSTEMS

Content in this module is focused on the development, distribution, and utilization of electrical energy. Units included are electron theory, magnetism, electromagnetism, electrical measurement, electrical circuits, electric current control, and electric power systems.

Laboratory activities included are: static electricity experiments with glass, steel, plastic, rubber rods, pith balls, silk cloth, and fur; magnetite; magnetic field experiments with bar magnets and iron filings; electro-magnetic field experiment with battery, compass, switch, and single wire; magnetism as the link between mechanical and electrical energy—equipment includes coil of wire, permanent magnet, and galvanometer; DC generator; AC generator; shunt-wound electric motors; series-wound electric motors; two-pole and three-pole armatures; universal motors; DC ammeter; DC voltmeter; AC voltmeters; step-up and step-down transformers; series and parallel circuits; series and parallel connection of cells; rectifiers; variable resistors; and energy conversion from electrical to mechanical, electrical to light, and mechanical to electrical.

INDUSTRIAL CHEMICAL ENERGY SYSTEMS

Emphasis in this unit focuses on the sources of chemical energy and the conversion of these chemical energy forms into other energy forms. Industrial applications of chemical energy are covered in both laboratory experiments and 35-mm slides correlated with the programmed information in the text.

Laboratory activities include: making a primary dry cell; testing of cells; assembling a secondary storage cell; testing the secondary storage cell; construction and testing of fuel cell; static testing of solid propellant engines; and petroleum experiment involving the cracking of oil to produce gas.

INDUSTRIAL MECHANICAL ENERGY SYSTEMS

Basic fundamentals and industrial utilization of mechanical energy are emphasized in this module. Major units include mechanical theory, measurement of mechanical energy, simple machines, mechanical transmission of energy, fluid transmission of energy, and mechanical energy in industry.

Laboratory activities include: fixed and double pulleys; inclined plane applications in internal combustion engines; direction, rotation, and ratios of meshed gears; gear ratios in automobile transmissions; gear relationships in automobile transmissions; and complete automobile hydraulic brake systems.

INDUSTRIAL NUCLEAR ENERGY SYSTEMS

Major units in this module are nuclear theory, nuclear elements, production of nuclear energy, uses of nuclear energy, detection of nuclear energy, dangers from nuclear energy, and careers in nuclear energy. The U.S. Atomic Energy Commission supplied a number of excellent slides which show the utilization of nuclear energy in modern industry.

Laboratory activities include: detecting radioactivity in radioactive material; assembling an atom; assembling of a nuclear reactor; detection and measurement with Geiger counter; radioactive shielding; detection of gamma rays with the radiological survey meter; and measuring radioactive exposure with the dosimeter.

INDUSTRIAL HEAT ENERGY SYSTEMS

Major units included with this module are heat theory, heat energy from electrical energy, heat energy from light energy, heat energy from chemical energy, heat energy to mechanical energy, heat energy from nuclear energy. Empasis in all units is on the industrial applications of heat energy and the processes involved in transforming heat energy to other energy forms.

Laboratory activities included are: transfer of heat by conduction and radiation; spot welding; steam engine; green house effect; thermo-electric generator; heat engines; and measurement of heat energy.

INDUSTRIAL LIGHT ENERGY SYSTEMS

Content in this module placed emphasis on the utilization of light energy in industry and on the potential uses of the laser or optical maser. Major units included are light theory, light sources, light measurement, light characteristics, solar energy, and coherent light.

Laboratory activities included are: measurement of light with a light meter; measuring the intensity of radiant energy with the radiometer; proving the basic law of reflection; measuring reflectance; refraction; double convex and concave-convex lenses; calcite crystals; polarizing lenses; photocells; solar cells; effects of color filters on laser beam; scattering the laser beam; polarization of laser light; holograms with the laser beam; and determining if the laser beam is collimated.

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Demonstration of How Audio-Tutorial Materials Are Prepared

A.O. Brown, III

Before starting into an audio-tutorial program, I believe there are several prerequisites. First, you must be convinced that self-instruction has a place in the educational system, that it is a supplement to the methods that you have at your disposal to assist your students in the learning process.

Secondly, you must be convinced that learning belongs to the learner. This system puts learning into the hands of the learner, allowing him to progress at his own rate. With these prerequisites in mind, let me show you how audio-tutorial methods have been used in our laboratory and how the results have improved our students' learning situation. I believe that I can illustrate this by an examination of the advantages and disadvantages found in our application.

First, we will examine the advantages of audio-tutorial instruction. I believe that the major advantage is that it is one-to-one instruction. The student is sitting at an instructional or laboratory position, often referred to as an instructional carrel, receiving his instruction by taped audio lesson. The instruction is presented to him by the instructor via the tape recorder. The student has control of the tape recorder, and thus control of the flow of information. This is essentially one-to-one instruction that is carried on by the individual learner and his teacher. The student is not competing directly with other students; therefore, he is participating in a non-threatening method of instruction. If the student finds that he doesn't understand some part of the lesson, all he has to do is to back up the tape recorder and listen to that portion again.

Another advantage is that it frees the instructor to work with individual student problems in learning. The routine instruction is carried on by the audio lessons, and when a student has a real tough problem, one that he cannot solve by use of the audio material, then that student can come to the instructor and receive individual, personal, instruction to help solve his problem. This doesn't mean that the instructor can escape the instructional scene. In fact, I think you will find if you use this technique that it will require more of your time than was necessary when using some other instructional method. However, I have found in using this method that our students progress faster through the material and instructional time is conserved both for the student and the teacher. We use the time gained to cover more material.

Now we must examine the disadvantages of the system. First, you must have available, or be prepared to purchase, tape recording and playing equipment. The equipment that you will need to prepare lessons for the learners must include recording capability. The tape-playing equipment required for the learner is not very expensive, but it is necessary to have multiple installations. These tape players do not have to be very elaborate.

Our particular system cost us more time than money, because we were able to secure the tape recording and playing equipment from a language laboratory that was being scrapped in favor of a newer system. Using the equipment and student booths that were designed for the language laboratory installation, we devised our own system. This does require some outlay of funds for equipment, but not much.

A second disadvantage is the amount of time necessary to prepare the instructional material. The materials require a great deal of time in preparation. I believe you will see why this is true when I go through the steps that are necessary to prepare this type of material. I would estimate that during our original project it took somewhere near 100 hours of preparation time per hour of instructional material produced. This 100 hours would include my time, the photographer's time, time for setup and evaluation, time for typists, and so on. Therefore, I would recommend to you that you request that time be allocated to you do this work if you intend to take it on. This type of materials preparation is too time-consuming to do during your spare time. My first A-T course was done almost entirely on my own time. I spent most of my evenings, weekends, and vacations for nearly two years in the preparation of one course. For this reason, I would recommend requesting that time be allocated from your work schedule to do this rather than trying to do it on the side. However, if you can't do it any other way, I believe it is worth the time. These are the major advantages and disadvantages that we have been able to observe with our system.

Now let's turn to the preparation of materials for an audio system. The first thing that must be done is to set up the goals for the particular lesson that you are working on. That is, write out what you hope to achieve by presentation of this lesson to your students.

As a second step, you must write the objectives for the lesson. Include in each objective the following characteristics: (1) Identifying the behavioral act that you wish to have the student participate in. (2) Define any condition or conditions under which this type of behavior will occur, and (3) tell him what is acceptable in terms of the performance that he must demonstrate before he can complete this particular objective. If you have not studied one or more of the books available on preparing behavioral objectives, I would recommend this type of reading to you. I believe you will find that writing your objectives is a very important part of preparing any lesson.

You may wish to break the objectives down into a number of specific process objectives for particular parts of the lesson. In doing this, you may discover, as I often do, that you have too much material for one audio lesson and therefore decide that you will want to break it into more than one lesson.

After you have written your objectives, the third step is to outline material that you wish to cover in complete detail. From the outline, separate the material into theory and experimental components. In our program, we use the audio to discuss the theory. In this technique, the material that underpins the laboratory lesson is presented first. We proceed to back up the theory with the experimental procedures that demonstrate the various principles. Since theory and experimental proof are all tied together on one tape, the student can back up on the tape and listen to the theory again at any point during his experiment. Thus, he can reinforce anything that he finds that he does not understand during the experimental procedure.

After making the detailed breakdown of theory and experimental parts, the fourth step is to take 35-mm slides of each part of the experiment. If it is to some advantage to have slides such as graphs or illustrations of the type that might appear in text material, I would insert these at this point to back up the theoretical material.

In preparing your 35-mm slides you will often shoot many more slides than you will actually need for the lesson. I find that it is an advantage to shoot every possible step in the procedure and every typical result that can be found during the process of operating the experiment. Since it takes time for the slides to be processed, you should do this previous to the time you plan to tape your instruction. In this way, you will have the slides back at that time you are ready for scripting.

The fifth part of the preparation procedure involves making the instructional tape, which is the heart of the system. The 35-mm slides, as I use them in most cases, are a feedback mechanism to show the student where he has progressed correctly throughout the experiment or where he may have made an error. I find that slides are better for the student to compare his results with than audio-taped results. However, the audio-taped instruction is still the heart of the lesson.

I understand that many people proceed to do this next part of the lesson in different ways. I will relate my own technique to you. This is a procedure that I have developed over several years of working with preparation of audio material. First, I prepare my detailed outline and my slides. Then I run through the experiment step by step so that I know every part of the experiment and have the details in mind. Then I sit down with the outline and I tape the theory as if I were sitting in a chair facing an individual student and trying to explain to him the importance of, and the best possible way to understand, this material. After this material has been taped, I do the experimental instructions as if I were conversing with a student over his laboratory setup. I take the tape and have a secretary prepare a typed script with double double spacing; that is, four spaces between each line. Since the script is a conversational tone, all I have to do is correct errors in grammar and interpretation.

These are areas where a student might wrongly interpret what you said at some point in the presentation. After correcting the script, I have a second double spaced scrip typed. Then I mark on this script the position of the cues for slides and for other materials that will be presented during the audio lesson.

While I am going through the audio preparation process, I have been viewing the 35-mm slides so that they become an integrated part of the instructional material. After the script has been prepared, I make a taped master copy of the script with the slides that are designed to accompany it and then have several students try this material out. They will tell me where they have difficulty in understanding the material. After receiving the student comments, I go back over the audio tape script and edit it to remove anything that is unnecessary and to add additional explanation where needed. I may also need to add a slide or two, or I may find that I can take out a few slides.

I then prepare the final script, audio-tape the final form, and correlate it with the slides. At this point, you are ready to have your slides duplicated so that you have a number of slide sets ready. I might mention that if you don't want to use slides you could possibly use black and white pictures or drawings assembled into a booklet that goes with the tapes. Some persons have tried this and found it to be a very successful technique. I personally like the versatility of slides, along with the color, which I think adds something to the learning situation.

After the final tape and slides are prepared, they are placed in the instructional carrels for the students to use in a regular course. Following the first full usage of the material, I review it again, correcting and preparing new materials that may be necessary to make it completely useable, and then place it into full service.

I have found several things that might be of particular interest to those of you anticipating the use of this type of material. I presently use reel-to-reel tape. I believe it would be better to use cartridges to save wear on tapes. I inherited my system and didn't choose the original tape machines. I did, however, choose the Kodak carousel slide projectors, and I have found that you need the remote control type of projector with a short projection length lens. The minimum configuration that Kodak markets that will do this is the 650 Carousel. This is not an expensive projector, but it is more expensive than the 600 which is the minimum-priced model. Another thing that we found out is that the bulbs that are used in the Carousel are extremely expensive. I wrote to Kodak about this and found that there are long-life bulbs available that are priced for a very small amount over the original bulbs; these will last ten to twenty times longer than the original bulbs.

One point I haven't spoken about is evaluation. Evaluation can be carried on during the instructional process by asking questions or putting small quizzes in the material, or it can be carried on as a pre-test post-test situation. At present, we are investigating some new IBM punch card type testing devices for our program. I have nothing to report on this method yet.

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Interdisciplinary Studies

The Relationship Between Industrial Arts and Junior College Technical Education

L. Dayle Yeager

A relationship between industrial arts and junior college technical education may or may not exist. The nature of association between the two, whether effective or ineffective, depends upon personal and professional philosophies, vantage points, and an accountability of theory and practice. Therefore, a relationship can be established or rebutted.

AN ESTABLISHED RELATIONSHIP

There is little doubt concerning a relationship, for the two areas are, or could be, closely united. Both share mutual associations and similar goals, as demonstrated by the following: As stated or implied by their definitions, each is concerned with industry and the world of work. Industrial arts is that part of general education concerned with the study of industry and its tools, materials, products, processes, and occupations. Technical education is concerned with that body of knowledge organized in a planned sequence of classroom and laboratory experience to prepare students for a cluster of job opportunities in a specialized field of technology.[1]

Each is associated with industrial education as it is defined as "a generic term which broadly defines that part of education which includes technical education, industrial arts, and vocational-industrial education."[2]

There are similarities between their general objectives, which are as follows: Industrial arts seeks to provide general education experiences pertaining to industry that contribute toward total education, or educating the "whole" child. Technical education seeks to provide occupational experiences needed to develop specialized technical personnel for the world of work.

Certain characteristics common to junior college technical programs and industrial arts programs suggest a relationship. Among such characteristics are the following: Both curriculums are designed for full-time day students. Both curriculums emphasize laboratory learning experiences rather than "straight theory" reflected by traditionally academic subjects or heavy production activities associated with vocational-industrial education. Both curriculums stress practical problem solving. Both curriculums rely heavily upon theoretical and technical information, as compared to manipulative skill attainment.

A definite relationship is implied by the curriculum areas of each. For example, traditional industrial arts offerings include woods, drafting, metals, power mechanics, electricity-electronics, graphic arts, and crafts. Counterparts in technical education (to name a few) are the following: Woods—Building Materials or Construction Technology; Drafting—Design and Drafting or Architectural Drafting Technology; Metals—Machine Tool Technology; Power Mechanics—Automotive Technology; Electricity-Electronics—Electricity or Electronics Technology; Graphic Arts—Commercial Art, Offset Duplicating, or Printing Technology; Crafts—Plastics Technology.

Regardless of the grade placement of these offerings in the industrial arts continuum, certain contributions toward technical education should be realized—thus establishing a more efficient relationship between the two. Among these contributions are the purported "unique" objectives of industrial arts:[3] to develop an insight and understanding of industry and its place in our culture; to discover and develop talents, aptitudes, interests, and potentials of individuals for technical pursuits and applied science; to develop an understanding of industrial processes and practical application of scientific principles; to develop basic skills in the proper use of common industrial tools; to develop problem-solving and creative abilities involving the materials, processes, and products of industry.

The Western Michigan study, as reported in the September 1971 issue of IAVE, indicates a definite and increasing relationship between technical education and industrial arts.[4] Among the points made were the following: Content of many vocational-industrial and technical courses at the two-year institutions was the same as was offered in industrial education teacher preparation courses at senior institutions. Seventy per cent of the students majoring in industrial education were transfers from junior colleges.

Articulation is needed between junior institutions and universities preparing industrial education teachers.

A REBUTTEO RELATIONSHIP

If a relationship exists, it must be effective. Otherwise it is not effective and, therefore, becomes non-existent. The success of a relationship between industrial arts and technical education depends upon their articulation, where articulation is defined as the efficient and successful combining of courses and curriculums to complete a successful educational experience. Articulation requires that the nature and scope of each contributing party be clearly established.

The nature and scope of technical education is definite, while the nature and scope of industrial arts tends to be nebulous, thus hampering an effective relationship between the two. Witness to this are the phases that industrial arts has entered:

Phase I. Industrial arts originated as manual training in the late 1870's and early 1880's. Its original purpose was to teach engineering students how to use hand tools. Soon afterwards, it was relocated at the secondary level to train students in handwork, which was largely vocational.

Phase II. Industrial arts then shifted from manual training to manual arts in the 1890's. The objectives were similar except for one addition: To improve the design and beauty of projects made in manual training shops.

Phase III. Industrial arts became an outgrowth of manual arts in the early 1900's, with the term being commonly accepted by 1917. At this point, industrial arts announced that as a part of general education, it would stress industry—but not on a vocational level.

Phase IV. Industrial arts, from 1917 to the early 1960's, struggled for so-called "academic respectability." It tried different approaches reflecting "do-it-yourself" values, consumer education values, a better way for teaching math, science, and social studies, creativity, and experimentation.

Phase V. The fifth and present phase reflects a critical period of development. Industrial arts accountability and relevancy are being challenged from not only outside of the profession but also from within the profession. Progressive educators are calling for a reappraisal and perhaps a redirection of industrial arts' purposes, objectives, subject matter, and grade placement. The following, expressed as viewpoints, are typical current conditions.

Viewpoint 1. Innovative programs, which may change industrial arts and its role in education, exist throughout industrial education. Twenty such programs are described in Cochran's book entitled Innovative Programs in Industrial Education.[5] According to Cochran, each of these reflect one of four basic approaches, which are as follows:

A. Integrative programs. This approach strives to unify educational experiences that have previously been unrelated or self-contained. Particular emphasis is placed upon correlational and inter-disciplinary endeavors involving several subject matter areas. Reasons for such programs are primarily pre-vocational and vocational.

B. Interpretation of industrial programs. This approach provides experiences "to adjust socially and occupationally to the conditions of industrial society."[6] Industry's entire structure, including marketing, production, materials, research and design, servicing, and its organizational patterns, is stressed. The reason for such programs is the absence of this aspect of society in present curriculum areas.

C. Occupational family programs. This approach provides a broad base for occupational experiences. Reasons for such programs are "based on the premise that youth should be knowledgeable about and should develop competencies utilized in broad occupational areas."[7] Beginning courses provide exploratory experiences, while advanced courses are aimed toward developing salable skills that are applicable to related occupations.

D. Technology-oriented programs. This approach provides a study of technology and its influence on society. Reasons for these programs are based on current industrial-curriculum areas being too narrow, and thus not presenting the full ramifications of technology. Emphasis is placed on a technological orientation involving the history of technology and its impact on society, automation, technical developments, scientific management, product demands, and the role of the individual in society.[8]

It is difficult to speculate whether these programs will supplement, supplant, or otherwise affect industrial arts or its relationship with technical education. However, many of these programs do reflect the following trends: de-emphasizing manipulative activities while facilitating more scientific and technical activities, thus producing a stronger alliance between the two instructional endeavors; moving toward integrated and interdisciplinary activities and away from traditional shops, thus increasing exploratory experiences having technical education implications; incorporating vocational rather than avocational interests, thus creating similar objectives; emphasizing a broader spectrum of technology, thus reorienting the industrial arts curriculum to technical education's world of work.

Viewpoint 2. Innovative programs have generated much scrutiny within the industrial arts profession. The assessments range from loyal devotion to steadfast opposition, with a "wait-and-see" segment separating the two. To some educators, innovation is typical of the profession, since it has continually redirected its educational thinking. For others, current innovations pose a serious threat to the profession.

Dr. Ditlow, past-president of the AIAA, states that current curriculum projects are not neglecting the basic objectives of industrial arts.[9] He further asserts that the difference is the actual methods chosen to accomplish the objectives. However, within the same article is the following sentence: "The real problem seems to be that the profession is somewhat fragmented in its structure and therefore interprets these objectives (as enunciated by the AIAA and the USOE) differently."

Dr. Nelson, while addressing the American Council on Industrial Arts Teacher Education in 1968, stated that "... in our search for respectability, industrial arts has gone completely ivory tower in its orientation and, consequently, in its curriculum thinking and development processes."[10] A past president of the ACIATE, he further asserts that industrial arts has eroded many of its unique features and substituted artificial exercises while pursuing the following endeavors: Industrial arts should be a vehicle for learning more science and math. Industrial arts should be a vehicle for enhancing creativity.

Dr. Nelson, while referring to a dozen or so curriculum projects, made the following statement: "Every one which I have read could become an excellent social-studies supplement, but in no sense a substitute for the kind of industrial arts which is needed today." Perhaps the industrial arts being envisioned by Dr. Nelson is partially reflected by the following summation points presented toward the end of his address: IA should become involved with the national commitment to educate everybody who can profit from formal instruction. IA should come down out of the ivory tower and face the critical instructional problems. IA should inaugurate an official dialogue with vocational educators concerning new educational challenges. IA should reassess its objectives and current position with respect to general versus specialized education. IA teacher institutions should develop competence among their graduates for conducting pre-vocational or occupational education. IA should call its present junior-high programs industrial arts, its senior-high programs pre-vocational or occupational education, and all the rest general education.

Dr. Lux, an instrumental proponent of IACP, apparently opposes a stronger alliance with occupational education.[11] In the February (1971) issue of School Shop, he strongly urges IA teachers to "think twice about jumping aboard the vocational-education bandwagon." He further asserts that "antiquated vocational education limits the concept (of education) to a narrowly-conceived range of occupational studies," while "industrial arts is a body of knowledge which may be used for any educational purpose, including an occupational one." Apparently Dr. Lux believes that this article was mistreated. In a letter to the School Shop editor, he attempted to clarify the title and perhaps its message.[12] He wrote, "The title which was placed on the article misses the most important point, i.e., there are a number of purposes for studying industrial arts which are equally as important as an occupational one."

Mr. Bradley, while responding to Drs. Nelson and Lux, suggests that the student rather than the profession should be the issue.[13]

Considering the personal philosophies presented within this viewpoint, one can only guess as to the relationship between industrial arts and technical education. It may be accepted or denounced.

Viewpoint 3. Industrial arts has continually broadened its perspective until it now reflects a state of flux and fragmentation. IA teachers currently are interpreting professional aims and purposes differently through varied approaches and techniques. For many teachers, a lack of direction within the profession is troublesome. The conscientious and dedicated wish to move away from the traditional if it truly is antiquated. This same group wishes to continue into innovative programs if their expectations can be realized.

Dr. Richards of North Texas State University recently surveyed public secondary school IA teachers in Texas.[14] He concluded that "the problems with which industrial arts teachers had the greatest difficulty were staying abreast of national trends in industrial arts, providing research and experimentation activities for students, and teaching modern industrial techniques and practices." Therefore, what is the IA teacher to do? Several choices are possible, according to Cochran in a School Shop article.[15] IA teachers may simply do nothing and hope for the best, personally go forth and pursue individual explorations for the one best plan, or strive toward a national curriculum.

Cochran does not support these choices for they would direct the profession toward either aimlessness or a single, regimented pattern. His choice is a multi-phase program that offers several possibilities for the student. The following are sub-divisions in Cochran's plan:

Industrial Implications. Beginning at the elementary level, this initial phase provides an introductory overview of the world of work through a coordinated approach.

Industrial Functions. "To provide exploratory experiences in the essential functions of industry" is the goal of this phase, which is located at the junior high level. Although classes are taught in self-contained laboratories, traditional areas of instruction are forsaken for the origin of industry, industrial organization, research and development, planning for production, production, distribution, and servicing. These programs are activity-oriented and correlated with social sciences, math, English, and physical sciences to a lesser degree.

Industrial Development. This phase assumes that phase two has been successful. Understanding the physical development of industrial facilities is the goal, which is based on realistic experiences and correlation. The realistic experiences center around life-like activities such as surveying, pouring footings, etc.

Industrial Custers. The final phase affords a high degree of flexibility for the student. He may explore industrial occupations, independently study industrial problems, specialize in specific areas, gain practical work experience, or combine those best suited to his needs. Although this plan appears different and complex, Cochran contends that its rationale stems from recognized programs and principles currently being used.

Little relationship between industrial arts and technical education can be imagined from this viewpoint, except possibly for Cochran's proposal.

Viewpoint 4. The fourth and final viewpoint reflects "traditional" industrial arts. Within this continuum, industrial arts extends from grade K to college with objectives being similar, but emphasized differently. IA in grades K through 6 prevails as a service area for other subject-matter areas. Primary objectives are to provide supplementary experiences integrated with other courses and to introduce industry or technology in its simplest forms.

IA is first seen as a separate area in grades 7, 8, and 9. Predominant objectives are to provide exploratory experiences and to develop pre-vocational interests. Beginning at this level, specialized classes in drafting, wood, metal, and electricity are frequently extended into grades 10, 11, and 12. The unique objectives presented earlier represent IA goals at this level.

Industrial arts teacher education terminates the continuum. The aim is to develop teachers having desired teaching skills, a broad understanding of industry, and technical competencies.

For many teachers, this viewpoint is the tried and proven approach. Its biggest shortcoming is the profession's reluctance to leave static areas and introduce modern, dynamic areas. To many, the strongest relationship between industrial arts and technical education is implied by this viewpoint.

CONCLUSION

A relationship can exist between industrial arts and junior college technical education because of their educational and philosophical similarities. However, the relationship tends to be indescribable, or perhaps ineffective, until industrial arts clearly delineates and unifies its role and scope. The profession must address itself to the following issues: If IA becomes relevant to other subject matter areas, it must exist for their benefit while demonstrating definite contributions which cannot be reputed by teachers and students. If IA becomes relevant to industry as an institution, it must adopt a curriculum totally reflective of industry and thus reorient many of its present endeavors. If IA becomes relevant to the student's life pursuits, it must concentrate on developing social and occupational traits that are fostered through specialized education, having pre-vocational and occupational objectives. If IA becomes relevant to the fundamental process of education, its traditional offerings must be either abandoned or upgraded and reoriented. If IA becomes relevant to other educational structures, it must unify its professional thinking and endeavors, regardless of whether these concentrated efforts favor innovational or traditional offerings. If IA becomes relevant to the student, it must culminate this century's search and struggle for professional integrity and concentrate on the student, his future, and his needs. If IA teacher education becomes relevant, it must assume leadership within the profession and be aware of the profession's realistic needs in developing and upgrading qualified teachers.

Industrial arts must move forward and satisfy the needs of today's students, but at the same time not forsake the benefit of the past. The following quotations are from an industrial arts book that has long been out-of-print.[16]

> Correlation is but another name for association, and what has been said of association and the law of association applies equally to correlation. ...The more specific and direct the connections or the correlation, the more certain are we that such connections will be made again under similar circumstances. The more general the instruction and the wider the possibilities for application, the weaker are the connections likely to be.
>
> If school life is to be devoted exclusively to generalities, to abstractions, and "mental capacity depends upon the concrete data with which it works," need we be surprised to find indecision when the product of the school is brought face to face with the realities, with the necessity for dealing with concretes? "To learn by doing is to learn with the best aids psychology and science have been able to discover." The remedy for a race afflicted with indecision is a liberal introduction of subject matter which will give children plenty of specific experiences with such concretes as may be found in the practical subjects. If such school experience should do no more than continue the respect, interest, and pleasure which little children have in the manipulation of concrete materials, it would have better served the 95% who must make their living by such manipulations than to have made them feel that theirs was a life of enforced drudgery.

FOOTNOTES

(1) Texas Education Agency, Information Guide and Directory of Vocational-Technical Progress in Post-Secondary Institutions in Texas, 1970-1971, p. 7.

(2) Partners In Industrial-Technical Education, USOE-Sponsored Project, John Feirer and John Lindbeck, Directors, p. 6.

(3) Ibid., p. 6.

(4) John Feirer and John Lindbeck, "Development of Junior/Community College Curricula for Future Teachers of Industrial Education," Industrial Arts and Vocational Education, September 1971, p. 13.

(5) Leslie H. Cochran, Innovative Programs in Industrial Education, (Bloomington: McKnight & McKnight Publishing Co., 1970).

(6) Ibid., p. 38.

(7) Ibid., p. 57.

(8) Ibid., p. 73.

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Visual Concepts of Mathematical Equations

Andrew C. Baggs

Elementary children using the modern math texts are presented with and asked to understand abstract ideas of numbers and their manipulation. What used to be called arithmetic is now presented as groups, concepts, numbers, and functions of numbers. Each idea is accompanied by its appropriate symbol, such as: $N=f(n)$, a concept of N as number and $f(n)$ as the function of the number. The child is shown that the function of N will produce different answers when the value of N is changed. He is also shown that different results will occur when the function is changed. Primary grade children, as well as those of the intermediate grades, play arithmetic games with this idea using a concept machine. It can be called an adder, a subtractor, multiplier, divider, or combiner, as desired. The terminology depends on the skill being developed. The degree of difficulty depends on the ability of the child to cope with that particular skill.

Arithmetically speaking, then, each $N=f(n)$ is graphically plotable. Given sufficient values (minimum of 3) for N, every equation $N=f(n)$ is an expression of a line. Each child can thus produce on a graph a visual illustration of the equation he has arithmetically resolved. Several pictorial variations of functions can be combined in a way children find informative and interesting, as well as decorative.

Industrial arts can add meaning to this abstract concept, particularly with the visualization of equations and the geometric developments that are introduced. The math instructor provides the theoretical instruction and directs the arithmetic computations. Each child developed and solved 12 to 36 equations for $N=f(n)$. These were used to produce sufficient lines to form the background or skeleton of the desired geometric shape. Industrial arts provided a challenging medium for the visual picturization of the computed equations. The child could do something with them.

Each basic line was plotted on graph paper. Auxiliary lines were added to give color, interest, and depth to the design. Illustrations were used to show that the auxiliary lines were also representations of $N=f(n)$ and could be individually computed if desired.

On a large sheet of paper, the skeleton figure was drawn to the full size the student desired. The child's design is only used once; each is individually unique. The auxiliary lines are drawn in color and position to add interest and detail. The type of wall hanging, the background material, the color, to frame or not to frame, each of these questions are decided by the student at this time.

Students were given the choice of three types of backing material. They were: 3/4-inch pine, 5/8-inch grooved fir paneling, and one-ply corrugated cardboard. As a covering for the cardboard, and for decorative effects on the other backing, loose-woven burlap was used which could be painted to produce the background color desired. Other materials such as felt, leathers, and other woven fabrics could be used if desired.

With the type, size, and shape of the background backing material chosen, the color applied, and the fabric fastened to the backing, the student is ready to make the geometric design. The full-sized pattern is fastened to the background and holes, in the case of the cardboard backing material, are punched in the cardboard with a fine-tapered awl. A large-eyed darning needle is used to sew the colored rug warp through the holes to produce the picture. Simple card sewing, similar to this procedure, can be done in the primary and intermediate grades. This will produce an effective, tangible result of the arithmetic efforts if the teacher does not want to get so involved with the larger devices and their corresponding preparatory work. The frame is made by the student if he desires to use it. It is a secondary effort, but adds very much to the finished product.

The three-dimensional nail lift with the wood background presents more of the traditional industrial arts manipulative skills. The wood backing must be finished first with whatever wood finishing techniques you employ. We used a clear urethane varnish. Some children stained the background or burned it with a blowtorch for a Spanish effect. Wire brushed, it is very effective. In every case, some guidance is necessary to achieve balance and proportion, as well as proper development.

Various sized nails were used to develop different elevations and depth. The colored rug warp is wound around the nails following the paper pattern, each warp thread representing a previously-drawn line on the original geometric development.

Combining the abstract ideas taught in modern math with the freedom of industrial arts expression can produce a visually understandable and decorative geometric concept. The resultant wall hanging is a meaningful presentation of understood mathematical symbolism as expressed by the student through the medium of his industrial arts abilities. The product produced has parent appeal, student satisfaction, and individual beauty. It makes a pleasing addition to any room or hall of a home. It is one of which a parent might say to his child, "You tried it, I like it" and mean it.

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Project SIAM: Simulated Science—Industrial Arts—Mathematics

Ernest G. Berger

With the speed of technological change in our productive society, it is essential that we continue to look for new and perhaps better methods of presenting industrial concepts to our students. One such method might be simulation techniques for industrial arts.

By definition, simulation is an operational model of a process that is designed for research, education, and training. It provides a student with a real-life problem and gives him the experience of making decisions on a miniature scale of the more complicated problem.

Simulation techniques, designed and used as a teaching tool, is a rather interesting concept for industrial arts in the public schools. The quality that distinguishes this from other pedagogical techniques is that it is often the only means available to duplicate expensive new equipment and processes that could never be purchased in its true-life form.

Simulation techniques are often used by government, business, and industry in their education and training programs. It is especially useful when the risk of studying new techniques and processes in real time is often so great that it is not feasible to try it with living organisms. One example is the astronauts, who were first placed in a simulated environment, exposed to emergencies, and taught to respond correctly before they ever left the earth's friendly environment.

Other examples are the "flight simulators" used by the armed forces and the commercial airlines to train their pilots and crews. The early Link-trainer is an example of this type of simulation. One airline recently announced its successful training of a commercial airline pilot before he ever set foot in an aircraft.

The SST had an operational simulator and was ready to train pilots even before the first mockup of the aircraft was built. Driver education teachers in some of our public schools use simulators to expose the students to the hazards of highway traffic even before they set foot in an automobile.

There are many other examples of the use of simulation in the space program. The Mercury Simulator trained astronauts to fly their spacecraft long before it was actually built. The 1/6-gravity simulator at Langley Research Center taught man how to operate in the lunar environment before he ever landed on the moon. In the rendezvous and docking simulator, man learned that it was necessary to "slow down" in order to "catch up" to another orbiting spacecraft for docking. The Lunar Module and Apollo Command Module simulators at Kennedy Space Center are other examples of the more complex type of flight simulators. Even the Lunar Rover had a simulator counterpart for astronaut training.

At the moment, many new NASA simulators are being developed for future space ventures. One such device is the "solar storm simulator" (for Skylab crew training) at Marshall Space Flight Center as well as the Space Shuttle Orbitor (for pilot training) at McDonnel-Douglas Corporation in California.

How might the principles of simulation be applied to industrial arts programs in the public schools?

One such project was successfully developed to test this new technique. In this learning project (Project SIAM) the students become deeply involved in creating their own learning situation and then solve the technical problems they discover. The design problem was to design, instrument, and test fly a space laboratory simulator much like Skylab. The project suggested a series of technical investigations for which answers are not always found in textbooks or from the instructor. Therefore, learning the art of technical investigation became one of the main activities of this applied research project. Learners were encouraged to obtain information from many outside sources, such as technical experts in local industries. They wrote letters to different private and government space agencies which disseminate information relating to simulator construction. Brainstorming and sketchstorming sessions were incorporated to help the teams crystallize their thinking on the best possible solutions to the basic design problem. A NASA "Spacemobile" team was used as an additional resource team, and also became actively involved with the learners' project. Selected technical films gave the students a visual idea of what has taken place in space colonization and technology to date. Books relative to space stations and space travel were readily available and used extensively by the students as they contemplated solutions to the problem.

While student-designed simulations such as Project SIAM may not always turn out to be perfect, it does involve the student designers in a dual learning situation similar to experimental researchers as they apply imagination, inquiries, and discovery in the solution of similar problems.

Students are bound to make mistakes; learning by failure sometimes becomes the principle value in certain types of classroom simulations.

The learning that takes place from simulations often differs qualitatively from the output of the regular teaching methods. These differences arise out of the structure of simulations and the atmosphere generated among participants.

Advantages of the simulation technique are as follows: By their nature, simulations promote a high degree of student involvement. The consequences of one's moves and/or decisions are immediately observed. They are self-judging. Simulations alter behavior patterns rather than verbal intentions. It teaches students to think critically in terms of their own skills, knowledge, and experiences. They convey the essential elements of a new systems concept or processes they replicate. It involves the students in a dynamic situation, bringing to life what might otherwise have been very vague abstractions. It is often an interdisciplinary experience much like life itself.

A well-designed simulation definitely will stimulate many avenues of thought which can be followed up for future study.

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International Relations

A Comparative Study of Scandinavian Technology (Denmark, Sweden, Norway) in Industry and Education

Eckhart A. Jacobsen

In the quest for possible solutions to the contemporary concerns in industrial education, a somewhat anthropological approach was taken to the study of technology and cultural developments in the old world countries found in Europe. An attempt was made toward viewing education in its totality, continually alert to industrial education's implications held for larger cultural problems facing our country and the world with reference to philosophical, social, economic, political, ecological, and occupationally related needs.

PARAMETER OF STUDY

The parameters of this study are condensed into the four following characterizations. The study provided four months of continuous interviews, meetings, written reports, observations with industrialists, educators, scientists, governmental officials, labor and management consultants, as well as professional organizations as a selected population. Each interview centered around the following concept—How does technology, its generation, and its potential, interface with education and industry; and how and to what degree is there conscious cultural evaluation,[1] control, and ultimate use made of technology? Visitations (traveling over 6000 miles) to research laboratories, schools and universities, industries, numerous offices of officialdom, and may homes of indigenous population by chance invitation. Countries visited: England, Denmark, Sweden, Norway, Germany, Austria, Switzerland, Netherland, Belgium, and France. This paper will confine its attention to Denmark, Sweden, and Norway.

COMPARISON OF CULTURAL DEVELOPMENTS

Why make the effort to compare the cultural and consequently the educational efforts of one continent with another? Rather, would it not be better to analyze the cultural needs and resources of a single nation and provide operational answers by professionals? While having some merit, this inbred approach to cultural problem solving leaves much to be desired in terms of introspection, projected and innovative thinking and planning.

The intent of this comparative study is therefore to describe educational solutions of societal needs practiced in other countries. These practices offer potential options for improved educational solutions to needs in the United States. Parochial preoccupation with our own provincial educational scene has often obscured the needed scope of our international cultural overlap. Unfortunately, the vast majority of professional educators are not aware that such international resources (opportunities) exist, let alone willing to acknowledge and examine the practices of others as possible solutions to their own ever-changing social needs. Also, operational phenomena for cultural problem solving too often is limited to isolated problem recognition and planning without the essential steps of implementation and action. Thus, how European countries solve problems and implement solutions may have relevance to our own needs in the United States (often the most imitated country on the surface of the earth).

DENMARK

There is in Denmark an arm of the ministry of education (established after World War II) known as the Danish Government Research and Technical Services Council concerned with the needs of government and science. It has an empathy for things industrial. The council is approximately 12 years old and serves three functions: providing financial

[1] Cultural evaluation and control as:
1. Philosophical innovation in terms of national needs and resources
2. Social interaction toward richer societal goals
3. Political decision-making and governmental choice
4. Economic commitment and industrial implementation.

support to industry for research in the technical science areas, serving as a secretariat for loan funding, a confidential practice protecting the recipient and the research purpose of the loan, and providing governmental scientific funding for universities in their effort to do advanced research work.

The funding to industry is made repayable if the research is successful. If not successful, repayment is not always essential. Universities do not repay the funding. Does domination exist on the part of government with reference to the university? The university does not feel this in any way impairs their effectiveness. The council in reality is a unique resource to which the university can relate for support that otherwise might not be available. Industry, however, is concerned about governmental support and possible domination.

Industry is concerned that many students are not occupationally or professionally oriented at levels comparable to our high schools and colleges.

Information distribution as well as retrieval is considered a most important problem. One unique concern is locating knowledge known to exist in one form or another at various locations. The library concept, as related to the rapid developing and handling of knowledge in the technologies, no longer is operationally practical. Book making and shelving is considered an antiquated approach to knowledge dissemination that is the essential dialogue necessary from the technological content and theory to actual practice in industry.

In contrast to the practice in the United States, there is essentially no military research practiced at the Danish universities. Stress was laid on programmed research, where possible, used in problem solving areas rather than developing knowledge for the sake of knowledge. Concern is held for avoiding what was termed "useless research." Industry, institutes, and universities could improve their research and other relationships with the public schools. Cost factors were sighted as one reason for the limited relationship.

Relating technological advance to the educational establishment is difficult at best. Outmoded programs and teaching practices where students find themselves as observers rather than participants in a dialogue constituting part of the learning experience caused unrest and protest. Students are finding a greater voice in the educative process. There are those who hold that the effective teacher is also a participant in research, whose research experiences provide significant substance to the quality of teaching. Research is costly in time, effort, and money. Fixed-target research was repeatedly stressed. Classical aimlessness sometimes identified with research is to be avoided. Disciplined use of the resources of time, effort, and money are viewed as essential and to be pursued.

A large percentage of the intellectually capable found an interest in and a desire to relate to the technologies. Those who find fault with the technologies are often found in the social sciences pursuing negative values rather than dealing with the social gestalt in terms of the total spectrum of cultural needs. Social need is relative in terms of cause and effect, in terms of process; truths are variable, rather than regurgitating old canons staring fixedly into the past as society hurtles pell-mell into the future.

The thought of "applied science" is once again fashionable in Denmark and other countries of Europe. For Denmark and Europe to survive and progress, they must recognize the character of cultural transiency, modifying its economic approach from an agrarian to a technologically-based society. In Denmark there is the feeling of need to be ahead of its competitors in the world market place. Craft and technological development (furniture, electronics, etc.) has placed Denmark on a rather high plane when compared to other nations. The concern of "thinking Danes" is the world characterization of them as passive, easy-going, and exceptionally tolerant people and the influence that foreign monies have on the economic control of their nation.

Social-democracy seems to best characterize their form of government, finding compatability in their economy, social structure, and the political patterns of the country. Some estimate that as high as 50% of the Danes "think slightly left of center."

Welfarism is a constant concern in Denmark. The union movement is relatively strong, playing an important role in determining living standards and influencing educational and political attitudes. Unemployment is relatively low, near 2.6. Unfortunately, the institutions within Danish society that deal with social concerns do not often work with the technological arm of society. Social institutions seem to be oriented toward the political left. There is a significant concern for the concept of freedom, but not free enterprise.

Government sponsors meetings with industries, farming, communities, business, and education in study groups where social, economic, and political plans are discussed. The resulting findings were that some educators are not doing enough for themselves, are seeking privileges without the willingness to accept responsibility. In an effort at increased student involvement, their view was that there was too much discussion with insufficient content, at best relating to the historical past or present with little concern for the future.

Schools find it difficult to relate to industry, educators knowing little of everyday industry. Visitation programs are offered by the Federation of Danish Industries, an open house program for students and lay people.

As elsewhere, there seems to be difficulty in educating and training skilled workers. A form of apprenticeship is being attempted in the technical schools at the post-graduate level. Also there is an effort on the part of industry toward developing programs within the company structure, similar to the "vestibule" approach to training in American industry. There are cooperative efforts between unions and industry that provide industrial or production engineering programs for foremen.

The relatively new campus of the Technical University of Denmark at Lingby (founded in early 1800's) has a modern program with contemporary facilities. Close working relationships exist between the various technological areas. Faculty development programs are successful, with some danger of inbreeding being present that sometimes blocks intellectual cross-fertilization so desirable when faculty are obtained from different schools. Equipment miniaturization solves space problems as well as serving future industrial needs. Denmark, a small country not having unlimited financial resources, feels the need to have a technical university that can provide a level of intellectual competitiveness that supports industrial export and relates successfully to economic stability. Innovative learning experiences seemed to be the rule, utilizing a cross-disciplinary approach to learning solutions to technological problems. Hence, students are generally well prepared in two or three peripheral areas related to their technological specialty. The relationship of practical experience being the end result of theory is very much the concern at this university. In addition, students are developing in a program that deals with frontier ideas and needs, taught by frontier faculty, thus producing frontier graduates.

A rather unusual method of learning provided rather dramatic results. The approach followed these three concerns: attitude, conceptualization, and method of implementation.

Attitude. Here the concern is for developing a transcient attitude that is flexible and inquiring. Regardless of the age of the learner, the field which the learner represents is a changeable one. Attitudes include "fiasco parameters," recognizing failure and success as the two sides of the coin of technological frontier experience, theoretical or applied.

Conceptualization. In addition to being a specialist in an area, the student must also be a generalist in two or three other related areas for a more potentially successful approach to problem solving. Miniaturization plays an important role as relating to costs, time, applications, and facilities (space) available.

Implementation. The relationship of scientific and technological development to industrial and other cultural applications plays a very important role in the thinking and learning process that even reaches into the economic and political spheres of Danish life. Examples include a human treadmill, including instrumentation, used for analyzing the ambulatory difficulties of patients in a hospital; another, a hydraulic compression machine for studying the plasticity of different kinds of materials. In each case, the educational experience was designed around a budgeted time, money, and need concept where the hope was that the learnings and the developing equipment or processes that resulted would be directly related to economic, industrial, medicine, or whatever improvement Danish life required. Here learning seemed to be almost an R and D approach to Danish cultural need, where the educative process kept pace with technological development.

Pure non-directional research has a low acceptability ranking. Some of the electronics technology education was directly related to industrial need and support. A high level of communication between education and industry is essential. All the work done for industry is on a contractual basis, including time and cost schedules. Research included advanced stages of solid state and microwave electronics.

The practicing relationship of professors to the industrial setting is viewed as highly important to their professional competency. Professorial rank is not a life-time position; rather, it continues only as long as an individual merits this kind of rating. Faculty are encouraged to seek government and industrial funding, an element considered in successful university operation.

An idea that has a counterpart in the United States was the desirability of an institute which combined the resources of five to eight different kinds of laboratories in order to take a more comprehensive approach to the more complex technological problem-solving learning experiences that evolve on the educational as well as the industrial scene. In projected programs, new institutes are being added.

A concern held by some was the obsolescence of content and the implied obsolescence of the student upon graduation. Inasmuch as need can be characterized as reflecting the future, the view was held that instruction should be increasingly oriented in the setting of research and investigation reflecting the "interests" of student and teacher. The essentiality of translating principle into practice was always present. Of much interest was the idea of "open" or "closed" design approaches to problem-prevention and problem-solving learning experiences. The open approach would include non-predetermined components to learning strategy development. Closed design included predetermined components to learning where the replication of ideas, principles, and developments are already established—a rather classical characterization of learning historically practiced.

Progress in education was viewed by some as essentially a political/cultural situation—a rather astute observation. The political aspect in cultural totality appeared to continually permeate most lines of thought, either consciously or unconsciously. Significant education must be willing not only to have its share of successes, but also must be willing (and be permitted by society) to make its mistakes. This is somewhat different than the approach to education in the United States. Because of the newness of the technology, it was felt that there were few traditions of cooperation between government and industry in behalf of education.

There was hope for greater use of radio and television resources in the total educational effort in Denmark. The concern for export and foreign trade exerts strong pressures on Denmark to produce highly-qualified industrial personnel.

As to availing themselves of educational or informational resources, Danish education subscribes to library systems and publication organizations wherever possible in order to obtain published technological content. Denmark resists what might be termed "controlled technological genetics" in terms of future development. Some of the negative views held are the results of historical and ancestral background which are essentially farming and fishing. Because of this aspect of cultural development and lack of communications, technology today is viewed and is considered as being somewhat outside of the current culture. Technology is moving faster than biological man is capable of doing.

In Denmark a controlled free enterprise system was in effect, that work was either accomplished by force or by motivation, and that in terms of positive motivation, work was fun and enjoyable. The idea of intrinsic motivation of a positive character, where work is equated to fun and enjoyment, was something different than I had met elsewhere in this country. A "techno-structure" image needed to be developed, and in terms of the population, some form of political-economic-educational pattern should be developed where there would be a concern for the care and provisions made for all people. The extent to which socialism has grasped the thinking of responsible people in Denmark, and how controlled and planned societies are being accepted as a way of life in the Scandinavian countries is significant.

From the point of view of management engineering, industry has substantial difficulty where new installations cannot be manned by knowledgeable personnel or specialists. Hence, it is one thing to make an effort to commit to the newer technologies and it is another matter to acquire the necessary skilled and specialized personnel to man this equipment.

There are limited technical specialists in Danish industry today, especially in the area of numerical control and other similar computer-supported technologies. However, the adoption of the newer technologies is one of the unique means by which industrial capacity and, hence, economic well-being can be achieved. New ways are also needed in Danish educational technology today.

SWEDEN

In a discussion with the rector or president of the Royal Institute of Technology in Stockholm, I learned that certain aspects of the institute were working, as an enterprise, with industry on specific problems. There were special courses offered to students in their programs through graduate work as well as similar courses in different institutes.

Mining technology is a university concern in Sweden; hence, they have become one of the international leaders in this area, serving not only Sweden, but many countries, including the United States.

Here, as in Denmark, the concern for scientific research and development was emphasized in terms of practical results. Financial support for such departments as the one in mining are as follows: 25% of the cost comes from industry (work done relates directly to services provided to industry), 15-20% of the funds come from the research council of the Swedish government, 10% comes from Swedish mineral industries, and an additional 25-30% of the operating budget comes from foreign industry such as Italy, Germany, Australia, America, and Canada, and the remainder from incidental sources. There is a conscious avoidance of military money in the Swedish University set-up. Their institutes have what they call advisory committees which are essentially contact organizations, providing the necessary relationship between industry and education, combining theory and practice to educational experience.

Any new developments that mature as a result of the research and development between the industrial and scientific communities are documented in papers and used in university classes and in the gymnasium (the equivalent of our high school) in simplified form.

The combination of the industrial, the economic, and the social aspects of this approach seem to be tied up to societal goals. These goals are concerned with enjoyment of life and life's activities, whether they be recreational or responsible for earning a living. Also, much of the thought is politically oriented, representing a totality concept of social thinking.

The Swedish government spends about 80 million kroner for technological research (about $16,000,000). As was the case in Denmark, Sweden is a small country, and hence, costs are a continuous major concern in any technological research venture.

There is a continuing and increased need for oral-visual programmed instruction. The traditional teacher personality is viewed as being in conflict with the newer technological developments in programmed learning, not only in terms of the equipment and the program, but also in its development and its use in the classroom.

One way in which teachers are updated in Sweden is by having engineers or technologists from various industries prepare and present the newer developments in the technologies to teachers in summer sessions.

Interestingly, there are increasing numbers of women entering technologies. In Finland, there are more women than men in chemical technology. Currently in Sweden there is almost 50% women in chemical technology, as well as in architecture. Television and home mechanics influence learning and learning attitudes. Home mechanics would include the different kinds of mechanics necessary in home maintenance, construction, motorcycles, bicycles, and household accessories.

Education in general, as well as higher education, is largely a government function in Sweden. School programs and organization are largely comprehensive in nature. Sociologically as well as psychologically, there is a strong feeling of need for equality in Swedish society. Education has been reasonably successful in providing technological content, though there is a growing concern for technological people to be more socially and humanly prepared and informed. This classic dichotomy between the technologies and humanism apparently is historically stronger and perhaps less freely dealt with in the Scandinavian countries than it has been in the United States.

The social-political relationship in the cultural development of Sweden has progressed to an advanced level. Because of the increasing role of the political facet of cultural development in Sweden, a larger number of organizations are becoming either related to, or totally affiliated with, government. This suggests a left-of-center form of government and cultural development. It was not fully apparent whether the Swedish people are totally alerted to the process by which this is taking place and whether in the end the process may lessen individual freedom when the primary goal is to bring all people closer to a common denominator.

The older generations do not take the eccentricities of the younger generations in Sweden too seriously. The traditional values of older generations are not the real concern of the younger generation, as represented by young people in colleges and universities. Younger people are more nature-oriented, more humanistic-oriented, notwithstanding the fact that technology provides the economic substance and base for a political and social culture of their own choosing. Human fulfillment, in terms of the joys that one should have in life, seems to be a primary concern. How this fulfillment is implemented is another question that hasn't, at least to my own observation, been fully answered.

The Royal Academy of Engineering Sciences has been able to draw up a set of operational rules with governmental representatives for making technical decisions relating to the cultural development of Sweden. This was felt necessary, inasmuch as many governmental representatives who are ultimately charged with governmental decisions had minimal technological backgrounds. Important here is the fact that a relationship has been established between the technological arm of Swedish society and the governmental arm of Sweden.

There is increased use of mass media in Sweden in exposing various problems of technology and science as it relates to cultural development. The number of TV channels possible in comparison to the States is extremely limited. Denmark and Norway borrow heavily on Swedish programming. These channels of public communication are controlled carefully by the government. Concern has been shown for communicating the new knowledges to lay people in Sweden, therefore Swedish society is developing an increased sensitivity toward technology. Data processing, especially as it relates to human engineering, is started to a limited degree in the public schools by the sixth grade. Pollution is the concern of education in the grade school and carries up to and including the United Nations, where the Swedish government has asked for a consideration of pollution on an international basis.

The responsibility for a prognosis on the future by technology and science is largely assigned by the government to the Royal Institute of Technology. This indicates again the governmental and socialistic hierarchy that influences the Swedish society and the fact that they do assign this kind of a responsibility to a specific group. The probability of guessing right by such a group is very important to the future cultural development of Sweden. This process needs continuous study, from the point of view of adequacy as well as to whom such a responsibility is assigned. It also suggests that where such a responsibility is so specifically assigned, a similar concern is less likely in other quarters of the society and, hence, total involvement may not be necessary in terms of their concern for equality. The question of how technological content newly acquired and developed reaches the population through its schools and through other communication media is considered extremely important. Cultural commitment is considered very important in this over-all consideration of educational programs and the development of society.

We know that the environmental crisis is often the result of success and of doing too much too well with the right sort of thing. To overcome the problems, we ought to draw up a list of priorities. Clean water, for example, is a world-wide problem. We don't know all the answers, but we do have the technological competence to take care of it. If we have a concentration of effort, within ten years we should have slowed the massive pollution of our inland waters and of the oceans, especially in waters near coastal cities. Awareness of risks by itself is not enough. We need rigorous analysis, united effort, and hard work throughout each country in the whole world.

NORWAY

In Norway, the communication of technological content between the university and industry is arranged through societies such as the Norwegian Association for Engineers. Complete dialogue and communication between industry and the scientists is a problem not yet totally solved in Norway, and the Norwegian Productivity Institute is attempting to bring together the two, especially from the point of view of the scientists from the university visiting and relating personally to industry. There is a Norwegian research center (NTNF) which is funded by the Norwegian government. It serves three functions: general research (such as social and medical research), technological research, and agricultural research.

The Norwegian Productivity Institute is seeking to relate computer companies and resources to small industry. This has met with variable success and perhaps is not too dissimilar in terms of success to our own efforts at Northern Illinois University with reference to computer-supported numerically-controlled production planning and control and its appropriateness to small industrial activity in Northern Illinois. Studies are being made on how industries in Norway are obtaining information. The population in general have a limited exposure, knowledge, understanding, and appreciation of what might be termed technology. This technological limitation by and large also applies to professional people (science excepted); hence, there seems to be a real social problem of education with reference to the nature of technology and how to relate it to the cultural development of Norway. At the present time, industrial research is rather limited in Norway, almost non-existent. There is very little military research. On occasions, industry contracts for research and development with other companies for specific research, which suggests that industry does recognize that competencies are necessary for this kind of activity.

There is also very little communication between industry and education. To discuss industrial and technological developments at the high school level in Norway is not too common. An effort is being made to establish industrial university seminars where the opportunities of industrial application of university education can be further explored.

While the planning of the Norwegian Productivity Institute includes different political points of view that may exist within the cultural structure of Norway, the Norwegian Productivity Institute does not take or hold any political position. One of their functions is encouraging continuous dialogue between labor and the manufacturing arm of the economy, i.e., management.

Industry is privately owned and managed, although there is an influence exerted upon management to be politically and socially alert to the total cultural needs of Norwegian society.

The institute was originally financed by Marshall Plan funds from the United States. The Marshall Plan provided for financing these productivity institutes in various countries, not only the Scandinavian countries, but in many countries in Europe including England, the Netherlands, Belgium, Germany, and France.

The Norwegian Productivity Institute encourages the councils on labor and management to ask questions as to how their decisions relate to the totality of social need and security in Norway. An example would be: More productivity means "what" to social welfare, the economic welfare, common social values, and the reduction of class differences in Norwegian society. Contrary to massive production goals that we often hold in the United States, the goal in Norway, and perhaps in all of the Scandinavian countries, is not necessarily one of maximum production, but rather identified with reference to goals as related to people's needs. The feeling is that increased production does not necessarily equate to an improved standard of living. There is a form of social welfare where the concern for others, the status of others, and the equality of others is the serious concern, rather than for over-materialism.

One of the projects of the institute is called the life-long education or "after education" program, a form of continuing adult education for the rest of a person's effective life. Working documents are prepared in the form of articles, written by specialists. Conferences with representation of student groups, university groups, labor groups, and management groups identify where there is concensus as well as differences. Then these are discussed, debated, and finally put into a published document which is then distributed to social, political, or industrial organizations. Social researchers are showing concern with reference to newer approaches to the cultural developments in Norway, including social, political, and economic institutions of the culture. There is a trend toward socialism.

The industry division of the university of Oslo has initiated a series of courses in business economics, administration, organization, and scientific management which are offered primarily to students in the area of applied science and whose aim is employment in industry and business upon completion of their education.

A second function of this division is to inform business and industry about programs at the university and at the central research institutes. It also provides conferences for technological forecasting and holds board of industry seminars for university personnel and representatives from the federation of Norwegian industries. Graduate students are given problems that are related to technology, industry, and their educational relationships. Hand-picked high school and college students are provided exposure to advanced research that takes place in the research institutes and are expected to respond, as a result of this exposure, to suggest applications and uses of this research as they might view it. Obviously, industry is interested in this type of student and absorbs them as soon as they are qualified.

Within the adult education program, there are teacher programs for the purpose of technological upgrading. By and large, the university is identified with basic research, whereas the institutes devote only 20% to basic research and 80% toward applied research. The research institutes are the central focus of the research program in Norway and relate directly to industrial education. This directly influences the economic status of the nation. One percent of the gross national product in Norway is set aside for basic research. This is approximately the equivalent of eight billion dollars. Specific efforts are being made to shorten the lines of communications between research, business, industry, and education.

There appeared to be no racial differences, and there are minimal social differences. There are, however, political differences present. While Denmark could be considered slightly left of center, Norway perhaps is slightly right of center. Notwithstanding negativism expressed by some people in all three countries discussed, there were many complimentary remarks about the United States "moon shot." We are well respected for our forthrightness and openness in our technological efforts and developments. There is far more science content in the United States news media than in the Scandinavian news media. However, there is slow improvement and steady progress in Norway in this direction. An effort is being made to train technical writers for this very purpose.

The Scandinavian countries are spending and living very close to the maximum of their resources. Sweden and Denmark are very likely living up to and perhaps a little beyond their resources. Norway, on the other hand, probably is living somewhat just below the point of difference between wise expenditures and excesses as far as their resources are concerned.

There is a successful concerted effort to raise the economic level of the working class, and there are very few if any people in Norway having large fortunes. Inasmuch as the standard of living will be increasingly tied to the results of the education that a person has, this poses a problem to many, and to the nation as well, inasmuch as they feel that they only need, and can use, a limited number in any technological, professional, or laboring area. This apparently is one of the planning problems that the government in its quasi-social approach to problem solving will have to face.

Norway is a sea-going nation. Its shipping is equal to all the other industry in Norway, the third largest maritime nation in the world, which suggests that Norway has a very large interest in shipping and a great deal at stake in terms of the success or failures related to shipping.

After World War II, there was established a technical research council to advise the Norwegian government and industry on research developments. There are few research laboratories. Industry often relies upon equipment suppliers for technical data. Difficulty in keeping up with technological developments often influences economic and industrial advancement. Also, technological advances are peculiar to the Norwegian natural resources. Any developmental effort requires significant governmental and research support in Norway. Industrial history in Norway often is anchored to the past, which makes for slow progress.

The concept of happiness and purpose in life is described by a story told me by a Norwegian. "There was a fisherman who had a small boat and a small net and went out fishing, catching a quantity of fish commensurate with the size of the net and the capacity of the boat. An American came by and asked the fisherman why he did not have a bigger net and a bigger boat, so that he could catch more fish. The fisherman raised the question as to whether he would be any happier catching more fish in a bigger net and bigger boat than he is happy now, still filling his nets and still filling his smaller boat." This story characterizes the Scandinavian philosophy of life. Norway needs a plan for an over-all program of utilizing the educated people of Norway, whether of universities or otherwise, but especially in higher education so that there would not be either an over-supply or an under-supply of needed individuals in specific areas. This would relate to economic needs as well as social welfare and personal well being—happiness, success, etc. This all smacks of a highly-planned cultural approach to total living and possibly socialism. I feel that in a planned cultural approach to supplying man's needs by government, man will ultimately suffer in the loss of his own freedom.

In summary, Americans are often annoyed by their own limitations when compared to European successes in education, recreation, transportation, social services, and other societal needs. These European successes are supported by tax rates that would stagger the American taxpayer. In general, Europeans pay from 60 to 90% more taxes than Americans for these services. High-level spending for public services is the greatest in Scandinavia, with Sweden the leading spender in the percentage of its gross national product, currently causing a severe strain on its economic posture. Taxation is approaching the point of diminishing returns that could retard economic growth and hence diminish tax revenues and public services. While Swedish and Scandinavian social programs are praiseworthy, it is very unlikely that it would be wise for us to imitate such an approach toward solving our own social problems.

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Leisure Activities

Industrial Arts Leads to Quality Use of Leisure Do-It-Yourself Activities

Lyndall L. Lundy

Affluent Americans are rapidly becoming the most leisure-oriented society in the world. Every year billions of dollars are spent on leisure-time activities. Some years the spending for the "World of Leisure" has topped outlays for our national defense. The U.S. News and World Report indicates that in 1969, 83 billion dollars were spent on activities made available by this nation's "leisure industries" (1, p. 58).

Leisure industries fall basically into two categories: those which make mechanical recreational type devices such as boats, engines, motorcycles, snowmobiles, camping equipment, and the like, and those which sell principally services such as resorts, marinas, campgrounds, golf courses, and trailer courts.

Economists and sociologists predict that at the turn of the century an overwhelming majority of the labor force will work in service industries.

Coupled with the mushrooming demand for outdoor recreation is an insatiable desire by Americans to own two homes, two or more automobiles, and numerous home appliances. Most homes are graced with televisions, stereos, tape recorders, dish washers, garbage compactors, and other electro-mechanical contrivances, all of which require adjustment, repair, and periodic maintenance.

According to news media, spending this past Christmas in one major American city was largely oriented toward the purchase of skis, cameras, televisions, and similar items. Shoppers bought things that give a person joy in his relaxation.

People in business and industry are keenly aware of this explosive trend in consumer spending and are scrambling to meet the demand. Literally hundreds of businesses have sprung up across the country to supply and make a profit on pleasure-seeking affluent Americans. Charles Gates, Jr., of Gates Rubber, believes the big field today is the leisure market. He says, "The greatest opportunities will come to those who can help man apply his growing leisure in a satisfying fashion—providing for recreation is one of the most significant tasks we Americans are presently confronted with" (7, p. 188).

HOW AMERICANS SPEND FREE TIME

Engstrom and MacKenzie indicate that the average American citizen spends his 70 years in the following ways: twenty-four years sleeping, fourteen years working, six years eating, three years learning, three years recuperating, four years talking, five years traveling, and eight years in leisure (2, p. 37).

As for leisure, others have estimated that a young man of today will have 22 years more leisure-time than did his great grandfather.

Evidence of leisure time is clearly manifested in the shortened work-week and government legislation placing holiday observances on Mondays. This work-week will likely become even shorter. O'Brien predicts, "The average work-week is due to fall to about 31 hours by 2000, and to 26 or even 20 by 2022" (4, p. 65). In other parts of the world, such as France and Russia, free time is mandated by government decree. French workers receive one month of paid vacation. Russian office and factory workers have a 41-hour work-week.

Americans have not always agreed with the concept of free or leisure time. There was a period when men like E. H. Gary of U.S. Steel believed the five-day week was impractical and that it violated the commandment, "Six days shalt thou labor." This attitude has obviously changed. At any rate, as machine processes continue to replace hand labor, more and more Americans will have an increasing amount of leisure time.

In the recent past, most wage earners were paid for the number of hours they worked or number of pieces they produced; their income ceased when they stopped working for any reason. This is changing. The practice of paying workers for holidays and time off for personal reasons has been increasing in recent years. Furthermore, most workers now receive pay for their annual vacation. Moore and Hedges state that paid vacations have spread rapidly since 1960. They say, in 1968, two-thirds of all workers in the nonfarm economy received a paid vacation. Of the remainder, many were newly hired employees, and the rest worked in firms that made no provision for paid vacation (3, pp. 4-5).

In 1946, vacation time in the United States amounted to 34.4 million weeks for all workers. In 1971, this free time was estimated to be 95 million weeks—a rise of 176% (8, p. 43).

Lumps of time off can make for health and happiness, or the result can be inherent restlessness. It isn't difficult to spot discontented vacationers among visitors and tourists. People say, "I'd give everything I possess to have some time off." And then when they get free time, they declare, "What I wouldn't give to have something interesting to do!"

Therefore, the gnawing questions are: "What will be done with the increasing amount of free time?" and "How will this revolution in work and leisure affect society?" Some worthwhile substitute must replace the fading 40-hour work-week, as these blocks of spare time unfilled lead to waste and frustration. Thus, providing for wholesome use of leisure time has taken on a great and new dimension.

Leisure time can be either a blessing or a curse, depending upon whether individuals are prepared to fill this time in a worthwhile fashion. Since it appears that greater numbers of people will be working less and less, it becomes increasingly important that they be prepared to live successfully in a leisure-oriented society.

DO-IT-YOURSELF ACTIVITIES

There are hundreds of different ways to spend leisure time, but perhaps the most profitable, the most enjoyable, and the most rewarding is the time spent on do-it-yourself activities.

Across the country there is an obvious resurgence of "use your own hands to make it yourself." Pollock says, "In an age of automation, of push-button automobiles, flip-top bottle caps, and assembly-line fashions, more and more people are making things by hand" (6, p. 1). O'Brien thinks that as Americans gain more free time, they will no doubt want to direct their leisure to useful, rewarding secondary activities such as making things with their hands (4, p. 65).

Along with enjoyment derived from making things by hand is the fact that a considerable saving is possible if people undertake build-it-themselves and fix-it-themselves projects. Then, too, in this era of increased leisure is run-away inflation and rising costs; consequently, a renewed interest is evident in fix-it-yourself. Most household malfunctions, along with minor adjustments and repairs on numerous electro-mechanical devices that surround us, need not be a crisis that requires summoning a costly and many times incompetent repairman. Instead, most around-the-home maintenance problems can be solved by an enterprising member of the family.

The popularity of "do-it-yourself," to a large extent, represents a substitution of unpaid labor for the earning of income. Instead of taking a second job, the worker performs a variety of skilled jobs in his own home, such as television and radio repair, painting, wallpapering, and carpentry.

Most people find money a hard-earned commodity; therefore, the do-it-yourself concept is very appealing to the typical American. It is attractive not only for the monetary saving involved, but, as was pointed out before, also for the personal satisfaction gained. It makes little sense to pay for services that individuals can accomplish and enjoy in their off-the-job time.

Some of the projects taken up by employees of Texas Instruments in Dallas, Texas, include rock polishing, jewelry making, antique car rebuilding, and assembly of short-wave radio equipment. Texas Instruments, as over 50,000 other United States companies, offers spare time activities as a by-product of employment, thus prompting the help to engage in leisure-time do-it-yourself activities (5, p. 27).

Another indicator of emphasis and popularity in doing-it-yourself is the number of books and magazines available that show the "cook book" approach on how to construct, assemble, and repair most anything. Along with the how-to-do information are numerous catalogs and advertising materials which list tools and machines, unfinished furniture, repair parts, kits, and other similar items. The do-it-yourself principle provides a wider selection of leisure-time activities, thus increasing the utility of free time.

INDUSTRIAL ARTS LEADS TO QUALITY LEISURE

In spite of all the books, magazines, and guides for doing it yourself, there is no substitute for in-the-classroom experiences gained through a well-equipped and well-taught industrial arts program.

Although the content and teaching methodology for industrial arts are being questioned and changed, it seems paramount that its recreational and avocational aspects must not be lost in the transition.

Recently, an NBC television star indicated his high school industrial arts experience sparked his interest in puttering around the house, building, and repairing in his spare time. Among other things, he now wants to build his own house. Similar experiences have no doubt led to the development of numerous other home workshops, and it is likely that the American home will be increasingly graced by tool-machine-oriented activity centers.

Industrial arts can provide the kind of background that will lead to leisure do-it-yourself activities. Among the more common educational benefits derived from courses in metals, woods, plastics, electricity-electronics, crafts, power, and drafting are the following: hand-eye coordination, understanding and knowledge of various materials, methods used in fastening materials together, processes used in changing the shape of materials, safe work habits, appreciation for quality workmanship, skill in the use of tools, machines, and equipment, methods of finishing, understanding of scientific principles, understanding of electro-mechanical devices, understanding of the internal combustion engine and other power sources, development of problem-solving abilities, development of creativity, and development of skill in describing things with drawings.

In view of the distinct advantages acquired from taking industrial arts courses, coupled with the definite trend toward leisure time do-it-yourself pursuits, it seems obvious that industrial arts must maintain if not give prominence to preparation for quality use of leisure time. Preparation for leisure time and do-it-yourself could be the core objective of industrial arts, but certainly must be more than a by-product.

There is no doubt that boys and girls are better prepared to live the "Good Life" in an industrial, technological, and leisure-oriented society if industrial arts has been a part of their educational experience.

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Leisure Time and Industrial Arts

Wendell E. Jordan

Undoubtedly, no other subject matter in any school system has so much relevant and necessary knowledge to offer all students as has industrial arts. This subject matter has been included in writings from the beginning of recorded history.

Perhaps the two most important purposes in the educational life of man have been "how to earn a living" and "how to effectively utilize leisure time." Of course, before the dawn of history, man's life dealt principally with diversified occupations: How to hunt, how to fight, and how to till the soil. At this point of man's development, he had very little time left to devote solely to his leisure. However, as man advanced through the ages of antiquity, one of his leisure time crafts, cave painting, has been duly noted by modern archeologists.

Industrial arts pre-dates academic education by several thousands of years and has always been directed at the welfare of the common man. The slowness associated with the evolving of industrial arts into the formal school curriculum was due in part to the fact that planned education was not for the masses but for the sons of princes, lords, and wealthy landowners.

Today, we have those skilled with their hands in the past to thank for what we commonly term as "our historical culture." Likewise, the culture of the future lies in the handiwork of those of the present who are skilled in the arts and crafts. The technical teachings and leisure time guidance received by students in today's industrial arts classrooms will help determine tomorrow's Henry Fords, Thomas Edisons, Wilbur Wrights, and others.

Philosophers have always argued convincingly for training in handiwork leading to worthy use of leisure time. So much so that in 1918, the United States Office of Education included the "worthy use of leisure" as one of the seven basic cardinal principles of education. Herein is the exact statement as issued:

> Worthy use of leisure—Education should equip the individual to secure from his leisure the re-creation of body, mind, and spirit, and the enrichment and enlargement of his personality.
>
> This objective calls for the ability to utilize the common means of enjoyment, such as music, art, literature, drama, and social intercourse, together with the fostering in each individual of one or more special avocational interests.
>
> Heretofore the high school has given little conscious attention to this objective. It has so exclusively sought intellectual discipline that it has seldom treated literature, art, and music so as to evoke right emotional response and produce enjoyment. Its presentation of science should aim, in part, to arouse a genuine appreciation of nature.
>
> The school has failed also to organize and direct the social activities of young people as it should. One of the surest ways in which to prepare pupils worthily to utilize leisure in adult life is by guiding and directing their use of leisure in youth. The school should, therefore, see that adequate recreation is provided both within the school and by other proper agencies in the community. The school, however, has a unique opportunity in this field because it includes in its membership representatives from all classes of society and consequently is able through social relationships to establish bonds of friendship and common understanding that cannot be furnished by other agencies. Moreover, the school can so organize recreational activities that they will contribute simultaneously to other ends of education, as in the case of the school pageant or festival.[1]

Some two hundred odd years before the U.S. Office of Education forwarded its statement, John Locke saw the worthy use of leisure as an important value in handwork. He substantiated this in his intention that learning manual trades were important "because they provide diversions or recreations"[2] for free time. Near the beginning of the nineteenth century, Frank Rowell opened a whittling school in Boston. The chief value of the instruction was not in the amount of skill gained by the boys but in the direction it gave to their leisure hours. Regardless of the era, past, present, or future, the main objective of a leisure time education plan is to habituate youth to the worthy use of their leisure.

During modern times, the sheer volume of leisure for the mass population has risen to gigantic proportions when compared to time spent working. For instance, in 1844, weavers worked at their trade 84 hours per week or the average of 12 hours per day, seven days a week. Shoemakers in 1855 worked 72 hours a week.[3] Farmers of the past worked from sunup to sundown, six days every week. These long hours of work and toil caused tremendous physical fatigue within the laborers, leaving no desire for leisure time activities.

However, between 1890 and 1913, the average work week was shortened to a total of 53 hours. By 1926, the manufacturing industries had shortened their work week to only 50 hours.[4] Today, the work week has stabilized at an average 40 hours. Even so, many modern jobs require 30 or less hours per week for completion. With the continual decrease in time spent at work, a renewed interest is being shown in worthy use of leisure.

Increased leisure time for all persons has created the world's biggest boom in travel, outdoor sports, spectator sports, and adult education. As a result of the multiplication of leisure time, related goods and services, manufacturing employment, and a need for new resorts have occurred all over the globe. Thousands of family-owned businesses and neighborhood stores have opened in suburban shopping centers to act as providers of custom furniture, quick appliance service, pick-up and delivery, etc.

Consumer demand for leisure time goods has proportionately increased as technology has expanded. With more available leisure time, persons can devote their "free" moments to creating various goods and services of personal interest that will satisfy the needs of themselves and/or other people. Just as industrialization has made increased leisure available, so has leisure made increased industrialization necessary.

As more leisure time becomes available, it no longer remains an individual problem. It becomes a family problem, a community problem, a school problem, even a state, national, and world-wide problem due to the gigantic number of people involved. Public education needs to accept a giant responsibility in directing leisure time interests of its students. Leisure time is not only for fun, but also for public works and self-actualization. The therapeutic values that come to those who work with tools, machines, and materials during their leisure hours need to be strongly emphasized in the industrial arts programs of the schools.

Industrial arts prepares persons to deal with the problems that relate to planning for the development and maintenance of various activities of pleasure encountered throughout life. During the course of a well-planned industrial arts program, the learning of tool functions and uses by the student will develop tool skills which in turn will probably lead to hobbies and other types of creative activities.

Problem solving and, most importantly, creativity have been the foundations on which students have built an interest leading to the fulfillment of leisure time activities. These have always been an intricate part of the industrial arts curriculum. However, until recently when educational researchers have produced evidence of the fact that creativity has a profound effect on achievement, learning climate, personality, and other traits of human behavior, creative activities have been held to a minimum in other disciplines.

Industrial arts is truly the melting pot for all interdisciplinary functions of the various facets of the school program. Physical activity, math, history, English, economics, science, physics, language; you name it, it is involved in industrial arts.

The relevancy of industrial arts for the students in real-life situations keeps them coming back for more. This is one course that they can actually relate to leisure time and labor time activities. It gives the students a relief from monotony and boredom by supplying an outlet for in- and out-of-class creative abilities. Industrial arts allows an expression of imagination and skills, thus providing a sense of satisfaction through self-realization. "No approach to a school subject is more appealing to boys and girls than one relating to their hobbies, interest, or the things they do just because they want to."[5]

Work and leisure are two interdependent parts of one and the same thing: an interesting and useful life. Those who do not work lose one of the greatest of life's satisfactions, and those who have no adequate leisure and no knowledge of how to use that leisure are deprived of life's greatest enjoyments.

FOOTNOTES

(1) United States Office of Education, Department of Interior, "The Seven Cardinal Principles of Education," Bulletin #35, 1918.
(2) Charles A. Bennett, History of Manual and Industrial Education Up to 1870 (Peoria, Illinois, Charles A. Bennett Co., Inc., 1926), p. 62.
(3) Anna May Jones, Leisure Time Education (New York, N.Y., Harper & Brothers, 1946), p. 9.
(4) Ibid., p. 10.
(5) Ibid., p. 68.

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Materials

Leather Craft in the Elementary Curriculum

Leon T. Harney

Based on the elementary school curriculum today, there is little wonder that many students are bewildered as to why they are in school. We have in recent years heard much about relevance and accountability. Still, little change has taken place in any corner to help youth understand or to help them have a successful experience with concrete activities.

The need for a strong foundation in fundamental learning skills is still the objective of education K through 6, but why must all the resources be paper and pencil activities? The main reason most of these materials are paper and pencil is that they have been published by a large well-recognized publisher for elementary materials. Now don't get me wrong. I approve of these materials when they have been tested on the widest cross-section of the school population and exhibit empirical data to support their worth.

Traditionally, curriculum developers have focused their attention solely on the intent, content, and methodologies of an instructional package, to the exclusion of the audience. If awareness of an audience is shown, it is usually geared first to the teachers and then to the students, and expressed in terms of "what is best for them," not "what they are thinking, feeling, demanding."

The audience must be heard, and input from these sources must be considered in the final curriculum package. The developer cannot follow all the suggestions made by all audiences. Consideration should be made of possible suggestions and demands, and the developer must determine the consequences of not attending to a particular suggestion or group.

The most difficult question to be resolved is how we integrate leather activities into the curriculum K to 6, keeping them relevant and accountable to teachers and parents. Teachers, for the most part, are activities-oriented and with some guidance are quite eager to try new materials. The task then becomes one of showing this group ways of integrating the leather activities into language arts, social studies, mathematics, science, art, music, and at the same time meeting the demands of our primary audience, the student. This is our most difficult task: applying scientific theory and principles to the student's environment while at the same time meeting and developing his aesthetic and utilitarian needs. We as teachers can become so engrossed in materials, tools, and processes that the application of the concrete experiences to meet curriculum objectives gets lost among the trivia. Knowledge does not exist just as knowledge, but to be applied by the individual to meet his problems and those of his neighbors whom we call society. Activities with leather become our vehicle in the elementary curriculum to expose children to a clean and useful material. It provides the stage for interaction, exploration, experimentation, and problem solving.

Work with children in the elementary classroom is best done in small groups or on an individual basis. The main objective should be set down before the group, and then each individual child should be given an opportunity to reach a solution. The process by which the student attacks the problem may be a simple approach to the scientific method or the "Design Approach," where they state the problem as they see it, but this should be a correlated activity.

In social studies, we have many possible activities as we look at the task. There also seems to be need for clusters of materials such as K-1, 2-3, 4, 5, 6, and activities for special children. Leather was used for clothing, housing, and transportation of our forefathers. It also figured heavily in the economics of the country as groups trapped and hunted on the far western frontiers.

The sciences also can utilize leather as a study of the chemistry of tanning. With the aid of a small jig and a torque wrench, the strength of leather can be determined. The principles of physics are also easily shown with a handkerchief and weighted leather jumper. All kinds of other experiments and many dioramas can be put togther, utilizing scientific principles and leather as the main vehicle to get across the ideas. The complete conservation of natural resources is very evident to students who study about the leather industry, for very little is wasted.

Language arts is also a subject area where the student can relate to an adventure, the study of early Indian and hunting expeditions. The use of mass production can require the writing of ads to sell your product, another very worthwhile learning experience.

Teaching aids for drill in spelling, sentence structure, or the use of prefixes and suffixes also provide meaningful opportunities.

Many worthwhile activities are also available for use of mathematics for problem solving, estimating materials, ordering supplies, and costing the finished products.

Much has been done in recent years to broaden the design concepts from the western nature-oriented design to the whole range of aesthetic understanding. Much can be done with leather in pure creative adventures. It is limited only by the imagination of the person using the material.

Improvement in eye-hand coordination results from the use of tools to make design. The strength of hands and digits is also increased and improved. Many activities can be derived to implement basic motor skills and coordination.

The current problems of today can be brought to the front of the group, in that drug abuse information can be thought up to utilize leather in creative ways. The use of leisure time for constructive activities and the development of safe work habits can be important products of the study of leather.

These are but a few of the many ways that leather can be used to broaden and create new excitement for the elementary curriculum.

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How to Start Leatherwork in the Elementary School Classroom

Wayne A. Wonacott

Among the artifacts uncovered from ancient civilizations are products of human workmanship made from the skins and hides of animals. No doubt the abundance of animals and the need for clothing and shelter forced men to develop methods of curing and the tanning of hides.

Leather has been an important basic commodity in the lives of practically all men right up to the present day. Science and technology have not produced synthetics that match the beauty, strength, and characteristics of "genuine" leather.

Leatherwork has been found in various levels of education under the heading of art, crafts, occupational and physical therapy, industrial education, and recreation.

Contemporary elementary school industrial arts textbooks all devote sections to leatherwork and its applications to the industrial arts program.

FILM CONTENT

This film on leatherwork was taken in three elementary school classrooms, and the children were in grades four, five, and six. The schools are located in different economic areas of the city.

The opening scenes show the fourth grade class organizing the tools and materials for work in the classroom. Tools, mallets, and tooling boards are distributed. Each child has his own mallet and tooling board, but he shares a set of five leather carving and stamping tools with three other children. The five leather tools are kept in a holder and are usually sufficient in number to keep all four children busy. For a class of 36 children, nine sets of tools are needed.

During the first work period, the children work with scrap leather, getting the feel of the leather stamps and the swivel knife. They are encouraged to create original designs. Then a simple project is made to take home; a rounder or leather medallion is a good product.

The work periods continue day by day with the children making key cases, comb cases, and small purses, learning the various skills necessary to complete the work.

However, in between the work periods, the teacher begins to correlate the leatherwork with other subjects. The fourth grade class learns how important hides were to the explorers who were looking for goods and trade routes. The class made up a bulletin board showing the explorers with their ships.

Leather was an important commodity during the mission and rancho days of California. The children constructed dioramas of a mission and rancho complex telling the story of life during these periods.

The older boys and girls continue work, making more difficult projects including head bands, belts, and visors. Virtually everyone successfully completes several useful products.

The last scenes of the film show leather consultants or experts assisting the teachers in starting leather work in the classroom. None of the teachers has had any previous experience.

The consultant demonstrates the tool skills to both the class and the teacher. He plans the room organization for maximum efficiency, working cooperatively with the children. He gradually works the teacher into the position of leadership. Two or three classroom visits usually get a class started and under the guidance of the teacher.

Consultant services are necessary for the implementation of a leather program in a school district. The consultants shown in the film are experts from the Tandy Leather Company's retail stores of Los Angeles, and they made themselves available for classroom demonstrations at no charge except for the cost of supplies. For information concerning consultant services, write the Tandy Leather Company, 1001 Foch, Fort Worth, Texas 76107, in care of Mr. Carson Thompson.

With further refinements, this film will be made available to schools through the Media Library of the American Industrial Arts Association, 1201 Sixteenth Street, Northwest, Washington, D.C. 20036.

Other films now available from the Media Library are: "How to Convert the Elementary Classroom into an Industrial Arts Laboratory," "How to Start Construction in an Elementary School Classroom," and "How to Construct Miniature Scenery."

Mr. Wonacott is supervisor of elementary school industrial arts, Los Angeles City Unified School District.

Plywood, A Material for the Future

Paul H. MacLean

The American Plywood Association is a non-profit trade association representing the manufacturers of softwood plywood. As such, the plywood association neither manufactures nor sells softwood plywood. In supporting its industry, the American Plywood Association provides three basic functions: quality control, research and engineering, and promotion of softwood plywood.

Quality control has to do with grade marking, inspecting, and testing of plywood to be sure that it meets minimum property standards as set forth by the U.S. Department of Commerce Product Standard, PS 1-66. It is through the quality control function that the Plywood Association assures the consumer of consistent good quality plywood.

The second function, research and engineering, is that of providing new products of plywood, improving old products, as well as providing reliable engineering values for engineers and other professional groups. To support this function, the Plywood Association has in Tacoma, Washington, a million-dollar research center devoted to nothing but basic plywood research. A staff of graduate engineers is available to provide technical information and assistance to the public.

The third function of the American Plywood Association is promotion. As a field representative of the American Plywood Association, promotion is my job. I call on architects, engineers, builders, industrial firms, farmers, and anyone who has potential for using quantities of softwood plywood. In these personal calls, I try to pass on information developed by the research and developmental operations and to aid people in correctly specifying and using softwood plywood. To help do this, the association has available more than 300 publications describing ways in which plywood can and should be used.

In the remainder of our program today, we are going to try to explain to you what plywood is, how it is used, and how it is made. We will also touch upon the grading rules for softwood plywood and plywood's properties.

THE FOREST PRODUCTS INDUSTRY AND OUR ENVIRONMENT

I would like to take a moment and get away from plywood as a finished product and look at its source, our forests. To do this, I would like to divide mankind into three groups. The first group will be those people who make things happen; presidents come from this group. These people are leaders, they are the outstanding people in the community today. The second group of people are those who watch things happen; these people are alert. They realize what is taking place when it is happening. They are on top of developing situations and have a definite contribution to make. The final category of people is one in which most of us probably belong. These are the people who wonder what happened after the fact. This is what the situation is with our environment today. Most of us are sitting back and wondering what has happened to our environment. We are wondering how come our skies have become so polluted that it is difficult to breathe comfortably in some areas. We wonder why our waters are rich with industrial wastes, so rich, in fact, that the Cuyahoga River in Ohio actually caught fire and burned a railroad trestle in the summer of 1969. We wonder how these situations developed. If we stop to think for a second, we will realize that we are all contributing to this problem, whether by driving our car, disposing of our trash, or taking care of our daily functions; we are polluting.

Nature has developed many ways in which to help us take care of our pollution. One of the methods nature uses to purify the air we breathe is found in the forests of this country. These forests are essential to us in the forest products industry because they provide our means of livelihood, and without them, we would have no income. But they are even more important to us because they are an important part of our ecological chain and psychological makeup, so it is necessary that we preserve our forests, protect our watersheds and the wildlife within them. But at the same time, we must harvest trees, because we as a people are very dependent on wood and wood fibers. These trees, of course, are harvested and used for many things, like lumber and plywood for housing, paper, adhesives, and a myriad of other products that come from wood fibers. So in order to provide for these functions and to perpetuate our forests, the wood products industry has developed four basic methods of harvesting trees. Without going into these methods, it should be made clear that they provide for future forests and, at the same time, provide man with necessary wood products.

Many people do not realize that the forests actually benefit from harvesting. If you stop and think about it, you will realize that forests have been harvested since the beginning of time, only nature's means are a little more violent than man's, for nature uses things like disease, windstorms, and fire. Man is a little more considerate of the forest when he harvests it; he can use selective methods that will remove only diseased or insect-infested timber, thus making for a healthier forest. Man, in harvesting the forest, can provide for revitalization of the forest floor, providing a healthier growing place for trees. Other benefits that are derived from harvesting can be seen in logging roads; these roads provide access to remote areas of the forest, not only for sportsmen and conservationists, but also for firefighters. In this way, many thousands of acres are protected from forest fire every year. So you see, harvesting a forest does provide definite benefits for the forest as well as for man.

Let's assume for a moment that we don't harvest the forest; let's assume that the forest is allowed to go on in a virgin state. Eventually trees, which are living things, die. When these trees die, a process of decay and death take place in the forest. This process consumes oxygen; in fact, as much oxygen is consumed by the decaying forest floor as the green foliage above can produce. In a well-managed modern multi-use forest, enough oxygen is produced by one acre of vigorously growing trees to sustain the needs of eighteen people, but it also provides for better trees. Today, through modern reforestation, we are able to replant and recover areas of the forest in approximately one quarter of the time needed to develop in the virgin forest. Whereas it might have taken 250 years to reach a mature cutting size in a virgin forest, a Douglas fir tree can be regrown in 60 years.

But don't misunderstand; we in the forest products industry are vitally aware of our need for wilderness. We as a people need places for solitude, places to hunt, to fish, and to enjoy life. But at the same time, we must be careful not to lock up our forest lands as strictly wilderness areas. We need our forests. We must remember that there are millions of Americans in this country today who do not have a decent place to live and are vitally in need of housing. Fully 80% of all housing produced in this country today is of wood and plywood construction. In order to provide housing for these people, we need even more wood than we are using today. Through careful multi-use forest management, we can have our forests and use them, too. We can have forests providing lumber and timber for many uses and at the same time providing recreational facilities and wilderness areas for the enjoyment of all. Wood is a renewable resource. The South today is working on its third Southern pine forest. Most of the Douglas fir forests in the Pacific Northwest have been harvested by clearcutting, and yet today they are more bountiful and beautiful than ever; this is the result of man caring for his forests.

PLYWOOD—WHAT IT IS AND HOW IT IS MADE

The preceding has been off the subject somewhat. It is important that we take care of our forests, but let's get back to our subject, softwood plywood. Plywood is a layered material made of wood veneers assembled with the grain of the wood of one layer laid at right angles to that of adjacent layers. This process results in cross-lamination, and it is cross-lamination, the bonding of wood veneers with grain directions at right angles to one another, that gives plywood its unique properties.

The first step in the manufacture of plywood is to obtain wood veneer. Giant logs are peeled or unwound into continuous ribbons of wood veneer using a rotary lathe, much as you would unroll a roll of paper towels. After the log is peeled, the veneer is then cut into smaller pieces (usually 4 x 8 feet in size) and sorted by grades into various bins. The next step, then, since the wood to this point is saturated with moisture, is to dry the wood to less than 5% moisture content. This might be compared with kiln-dried lumber, with a moisture content of around 15%.

After drying in huge ovens, the veneers are still not perfect. It is necessary to repair these veneers, replacing the knotholes and other defects with patches of wood veneer. After patching, the veneers are assembled into plywood. Adhesives are spread between the layers of the veneer, and the panels are assembled with the face grain of one layer at right angles to that of the next.

The assembled veneers are then moved to the press, the heart of the plywood operation. Placed between the plates of giant presses, heat and tremendous pressure are used to bond the assembled veneers into a panel of softwood plywood. After bonding, the panels are removed from the presses, trimmed, sanded, and inspected by the mill's own quality control personnel. This inspection determines whether or not the plywood panel is of the grade and type intended. Of course, the American Plywood Association also has a team of inspectors who are in the mill to spot check production, to take samples, to be sure that the plywood being manufactured is of the required quality. The inspector visits the mills unannounced at various times of the day, looking into all aspects of plywood production. As a result, the plywood produced by member mills of the American Plywood Association is entitled to bear the DFPA grade trademark of the association. Prior to 1964, the Plywood Association was known as the Douglas Fir Plywood Association. Over the years, plywood came to be manufactured of many more species than Douglas fir, and therefore it was expedient to change the name to the American Plywood Association. Customer acceptance of DFPA grade trademarks made it essential that these grademarks be retained, and they are still in use today.

PLYWOOD TYPES

Plywood is a panel of cross-laminated construction, usually 4 x 8 feet in size. It seems easy enough to understand, but there is more than that to plywood. The American Plywood Association provides over 30 grade trademarks to identify softwood plywood panels. Understanding these grademarks is the first step in understanding the plywood panel. While this subject may seem complicated at first glance, it is not really difficult. There is a set of grading rules for softwood plywood. These grading rules are entitled PS 1-66, which is a U.S. Department of Commerce Product Standard for the production of softwood plywood.

This standard divides plywood into two basic types. These are INTERIOR type plywood and EXTERIOR type plywood. INTERIOR type plywood is moisture resistant but is not a completely waterproof panel. INTERIOR type should never be exposed permanently to water or weather. EXTERIOR panels, on the other hand, are completely waterproof. They are bonded with thermal setting resin adhesives that will withstand any degree of exposure to water or weather. For this reason, panels marked EXTERIOR DFPA are your assurance of permanent, good quality exterior plywood. Many people don't realize that MARINE plywood is nothing more than a top of the line EXTERIOR type plywood. It is manufactured with special procedures using only B Grade veneer or better and is intended primarily for use in high speed boats, such as hydroplanes. In cases where the plywood panel will be exposed only to weather, the use of MARINE plywood is not only unnecessary, but it is also wasteful, in that the customer is using a better grade of plywood than he actually needs.

Many times people become confused by an INTERIOR type panel with the term "Exterior Glue" below the stamp. These panels are INTERIOR type because of the use of INTERIOR quality veneers in the panel. D Grade veneer is permitted only in INTERIOR type plywood. When D Grade veneer is bonded with an exterior adhesive, the large voids permitted in this veneer make possible localized veneer separation. For this reason, any panel containing D veneer must be of INTERIOR type and should not be exposed to extreme moisture conditions. It is possible to have an INTERIOR type panel bonded with exterior type glue. This panel construction does make sense for construction applications where you can expect a certain amount of delay between arrival on the jobsite and application to the finished building. However, it should not be confused with EXTERIOR type plywood.

VENEER GRADES

Six different grades of wood veneer are used in assembling softwood plywood. The lowest of these wood veneer grades is D quality veneer. D veneer is permitted only in INTERIOR type plywood. It allows occasional knotholes up to 3 inches across the grain and splits up to 1/2 the panel length by one inch in width. Structurally, D Grade veneer is sound, but it is obviously not an appearance grade.

The minimum grade veneer permitted in EXTERIOR type plywood is C grade veneer, which limits the size of the knotholes to 1-1/2 inches measured across the grain and the size of splits in the veneer to 1/2 inch in width.

C Plugged veneer is essentially an improved C Grade veneer. The big open holes have been replaced with patches and splits have been limited to 1/8 of an inch in width. Small worm or open bore holes up to 1/2 x 1/4 inch are permitted. An application for C Plugged veneer would be as the surface veneer in plywood Underlayment to which carpeting or a thin finished flooring material would be directly applied.

B Grade veneer is the minimum veneer grade permitted in MARINE grade plywood. B is a solid surface veneer, but it does permit sound tight knots and an unlimited number of patches. It can be painted if necessary.

The best grade veneer normally available to the local lumber yard is A Veneer. A Grade veneer is a smooth paintable surface. The repairs in the veneer are limited to 18 in a 4 x 8 foot piece of veneer. Patches are limited in type to what is commonly known as a boat patch, router patch, or shim.

The utmost in veneer grades is N. The N stands for natural, as in "natural finish," and that is the intent of this veneer. N is a special order only veneer, consisting of all hardwood or all sapwood with highly restricted repairs. N grade veneer is intended for use in fine furniture or paneling, where the beauty of the natural wood is of utmost importance.

READING THE GRADE STAMP

Now, the time has come to assemble these veneer grades into a piece of plywood. The grade stamp on a piece of softwood plywood will tell you what veneer grades are permitted in that panel. For example, in a panel stamped A-C, the first letter "A" indicates that the panel has A veneer on its face, the second letter indicates C veneer on the back of the panel.

Immediately below the letter grade, a GROUP number will be found. This GROUP number classifies the wood species from which the plywood panel has been made. Product Standard PS 1-66 authorizes the use of over 50 species of wood in soft-wood plywood. Within this range of species, there is a natural variance in strength characteristics. For this reason, the species have been classified into five groups, depending upon strength. GROUP 1 contains strongest wood, GROUP 5 is the weakest. It is not necessary for the average consumer to try to learn the classification of all species, but he does need to remember that the lower the group number (i.e., 1 is lower then 5) means a stronger panel.

It was mentioned earlier that sanded grades are identified by the veneer grades used for face and back veneers. However, with other plywood panels, the intended use makes it unnecessary to identify veneer grades. Such panels are identified by use. One common use panel is STANDARD, the panel name used to identify the regular standard sheathing grade of softwood plywood. The STRUCTURAL panel has special engineering properties that provide superior performance in high sheer applications, such as box beams, trusses, and sheer diaphragms. These panels are usually assembled of C and D quality veneer grades. They are INTERIOR type panels which can be manufactured with interior or exterior adhesives, depending upon the specification of the customer.

Because these panels are intended for specific construction applications rather than general use, identifying the species that go into the panel is unnecessary, but the strength of the panel and its suitability for a particular application are of paramount importance. For example, we find that STANDARD panels are primarily for sheathing applications on residential type construction, so rather than identify the species group from which the panel comes, it is more expedient to identify the maximum safe span for this panel on roof or floor supports. To do this, an identification index was devised. This is a set of numbers which appear to the left and center of the grademark. The first number in the identification index provides the maximum span permitted for that panel on roof supports in inches. The second number provides the maximum span in inches permitted for the same panel over floor supports. Let's assume, for example, that we have a STANDARD sheathing grade panel. In place of the GROUP number on this use panel, we find an identification index of 32/16. The 32 then would indicate the maximum span in inches permitted for this panel on roof supports, while the 16 would indicate the maximum span in inches permitted for the panel used as subflooring. If the species used in this panel were GROUP 1 woods, the 32/16 would appear on a 1/2-inch-thick panel. However, if we were to use a weaker species, perhaps a GROUP 2 wood, a thicker panel would be required to do the same job. The identification index 32/16 would then appear on a 5/8-inch panel. This identification index appears on all common sheathing grades of plywood. Every grade stamp of every panel meeting the requirements of the Product Standard will contain, in the lower left hand corner of the stamp, the designation "PS 1-66." These letters are your assurance that the panel has been manufactured in conformance with the U.S. Department of Commerce Products Standard for softwood plywood. Another number will be found in the bottom center of the grade stamp. This number (which may be a 1-, 2-, or 3-digit number) identifies the manufacturer of that particular panel. Each plywood mill is assigned a permanent identification number; that number is never assigned to another mill. Therefore, by contacting one of the regional offices of the American Plywood Association with good reason, it is possible to obtain the identity of the manufacturer of the plywood panel. Probably the most important feature of the American Plywood Association grade mark is the DFPA Quality Tested circle on the right side of the trademark. This DFPA grade-trademark is what provides the consumer assurance that he is obtaining consistent good quality plywood with reliable engineering characteristics.

In review, we have identified two basic plywood types, INTERIOR and EXTERIOR, the veneer grades, as well as sanded and sheathing grademarks. There are many, many other specialty items in softwood plywood with special grademarks, but for the most part, they carry the same essential information as those panels discussed. For further information about grading softwood plywood, contact the American Plywood Association at 1119 A Street, Tacoma, Washington 98401.

PLYWOOD PROPERTIES AND CHARACTERISTICS

Plywood has very excellent characteristics and properties that make it an unusually superb and useful product in building construction, as well as many other applications. First, because plywood is a cross-laminated panel, it has strength in both directions. Secondly, plywood is wood, and wood is one of the most versatile materials known in terms of strength and workability. Combining these factors results in a superior panel.

Wood is a good insulator, and so is plywood. Plywood provides thermal insulation in buildings that is equalled by few other construction materials. An example of this insulation ability is the fact that 3/4 inches of Douglas fir plywood will provide the same thermal insulation as 7 inches of concrete, 4-1/2 inches of brick, or 80 inches of steel. What does this insulation value mean to you? When building a home that must be heated or air conditioned, the plywood insulation is a definite benefit, although it is, by itself, not adequate; additional insulation materials are necessary. However, if an outbuilding such as a garage or barn is being constructed, then the plywood insulation value may be all that is needed. It will keep the temperature in the building several degrees warmer in the winter and cooler in the summer with no additional insulation expense.

A second important characteristic of plywood is its large panel size. Everyone takes for granted that plywood comes in 4 x 8 foot panels. This is obvious. However, every time a plywood panel is laid down on the job, it covers 32 square feet. This means that large areas are covered rapidly, minimizing construction time and, hence, construction costs. Along the same vein, plywood is also easy to fabricate. It doesn't require special equipment or skills to work with plywood. Again, construction costs are minimized.

In tests conducted by the U.S. Forests laboratory in Madison, Wisconsin, 1/4-inch plywood wall sheathing was compared with 1 x 8 inch diagonal wall sheathing. In these tests, the Forest Products lab found that the 1/4-inch plywood was more than twice as strong and twice as rigid as 1 x 8 inch sheathing when used on identically framed walls. Why is this important? Well, in California, many buildings are protected from earthquake forces with plywood sheathing, because plywood strength can be of utmost importance in preventing the collapse of a building during a violent tremor. Along the Gulf Coast and Atlantic seaboard, this same strength can provide excellent protection from hurricane-force winds. Again, the strength of plywood helps prevent the collapse of buildings, thus minimizing the damage resulting from nature's violence.

Plywood, because of its cross-laminated construction, is split-resistant. Wood tends to split parallel to the direction of the grain. However, in plywood, the wood grain is oriented in both directions and laminated together. A piece of plywood simply will not split. This allows nailing close to the panel edges when fastening. This split resistance also contributes to superior resistance to impact. This is why plywood is such a great material for siding a house, for kickboards in animal stalls, or for basketball backboards.

Plywood is durable. Softwood plywood will hold up indefinitely. This is proven year after year, time after time. In fact, if an EXTERIOR plywood panel delaminates for any reason, it is evidence of mismanufacture.

It has been stressed that plywood is a cross-laminated panel. One might therefore assume that the orientation of wood grain in the panel face would not be important, because plywood has strength in both directions. Such an assumption would be incorrect. Plywood acts much like an I-beam under load. That is to say, the forces governing panel stiffness occur in the extreme outer fibers of the panel. Thus, the stiffness of the plywood panel is dependent upon the face and back veneers, and the grain direction in these veneers is oriented in the long dimension. It is important, then, for maximum panel stiffness, that the face grain of plywood always be oriented at right angles to its supports. Also important to the stiffness of the plywood panel is the number of supports beneath the panel. Because plywood comes in 4 x 8 foot sheets, it is always continuous across three or more supports. This means that plywood is acting as a continuous beam would and, because of this continuous beam action, exhibits additional stiffness for a given thickness of material.

These are only some of plywood's properties. Many other properties and characteristics will become obvious as its uses are discussed.

PLYWOOD IS VERSATILE

Plywood is a very versatile material, one that can be used almost anywhere and for almost any application. This is one of the reasons why softwood plywood production has more than doubled in the last ten years and is expected to continue its steady growth rate into the future.

At home, plywood versatility might show up as a picnic box or a set of bunk beds for the kids, or perhaps a bookcase, or in repaneling a garage. Whatever the handyman is doing, he can make maximum use of plywood because the large panel size simplifies his work.

At work in industry, plywood is used for material handling devices, such as pallets. Plywood pallets, because of the smooth, solid top deck, provide maximum strength with a minimum of damage to the goods being transported. Plywood is also an excellent material for industrial crating. Its characteristics allow crates to be sealed more tightly, quickly, using a minimum amount of labor to provide a superior crate. Plywood also provides excellent shelving. The large panels provide adequate shelf strength; in fact, pound for pound, plywood is stronger than steel.

Recent developments in technology have included methods of applying fiberglass to plywood to make a fiberglass/plywood sandwich. This material has proven to be excellent in the manufacture of intermodal shipping containers, either 20 or 40 feet in length, and for truck bodies or truck trailer bodies. The material provides superior strength, post-free construction, and at the same time reduces maintenance costs.

Plywood signs have been around for years. I remember seeing an old photo, not too long ago, of a plywood sign in Washington State. A major bank in that area was advertising 2% interest rates on savings accounts. Today's high interest rates pretty well date that sign; it was built in the early 50's. Today, many states are using plastic-coated plywood panels for interstate highway signs. These signs provide maximum performance with minimum maintenance.

Of course, everyone has seen plywood boats. They can range in size from a small dinghy to a WW II PT-boat or a houseboat. Plywood's versatility really shows up in boat construction. Many boats do not show any evidence of plywood in their final form, and yet it is one of the primary ingredients in the hull.

Then there is building construction, using the lion's share of the plywood industry's production. When we see a new building going up, the first thing that might be noticed is that the construction fence is made of plywood. Behind that fence, even though there may be little plywood in the finished building, it is plywood form work that allows the contractor to make the beams, columns, and decks that make up the concrete building.

Plywood applications are also very important in residential construction. Plywood floors are common in many parts of the country. Thicknesses of 5/8-inch will provide superior single-layer floor construction if floor supports are spaced upon 16-inch centers. With thicker plywood, up to 1-1/8 inch, panels can span four feet in residential floor construction.

Plywood wall sheathing is also important. As mentioned in our discussion of properties, plywood wall sheathing that adds strength to buildings and helps them resist nature's violence. The Alaskan earthquake in 1964 proved that plywood-sheathed buildings were among the best-performing structures in the area. More recently, California earthquakes reiterated the same point. Properly-constructed buildings sheathed with plywood survive earth tremors with a minimum amount of damage. Recent Gulf Coast hurricanes—Celia in Corpus Christi, Texas, in 1970, and Camille, which pummeled the Mississippi coastline in 1969—bore out the importance of plywood construction. Plywood wall sheathing can minimize damage to a building.

In some areas of the country, however, buildings are not subject to earthquake loading or hurricane-force winds. In these areas, while plywood wall sheathing still provides the same amount of strength, it is not essential to the integrity of the building; therefore, many builders have used plywood simply to brace the corners of these buildings. Plywood corner bracing takes the place of the traditional 1 x 4 inch let-in brace. It provides strength and flexibility, while reducing the installation labor costs.

Another way to achieve strength in wall construction is through the use of textured plywood sidings. Plywood sidings come in many patterns and textures designed to provide beauty as well as structural strength to the building. In residential construction, 3/8-inch sidings can be applied directly to studs 16 inches on center, or 24-inch stud spacing can be used with panels 1/2-inch thick and provide superior performance with a minimum amount of cost.

Plywood roof sheathing has been in use for many years; in fact, over 90% of the roof sheathing in this country is now plywood. Again, plywood provides superior strength and flexibility. And one other thing, a solid plywood deck makes an excellent substrate for wood shingles. Just use proper construction methods, good quality shingles, and you will wind up with an excellent job.

Plywood's use in building construction is extensive, of course, and several common uses have been mentioned, but there are many other ways of building with plywood. For example, few people realize that there are plywood I-beams. Plywood I-beams take the place of wood joists and simplify the construction process. Also available are plywood components. Components are generally manufactured in a plant and shipped to the job-site for erection, thus speeding up the building construction process. These components include plywood box beams with lumber members carrying compression and tension forces, while the plywood provides resistance to sheer. A variation of the box beam is the folded plate. By bending plywood over preformed ribs, we can manufacture plywood curved panels, or if you would prefer to flatten these panels, we have stress skin panels. All of these component forms are excellent ways to utilize plywood's versatility.

In fact, plywood's flexibility, strength, and low cost make plywood one of the foremost building materials in low-cost and industrialized housing today. In addition to conventional methods of construction, industrialized housing manufacturers are adapting new plywood systems because of the strength it provides. This strength minimizes over-the-road damage and provides a superior building for a minimum cost. Several housing manufacturers are experimenting with the use of foam core plywood sandwich panels, using a polyurethane or polystyrene core, with plywood skins to carry the loads. These panels perform beautifully and can be arranged into a very economical system.

Before we leave the subject of plywood applications, I don't want to forget the farmer. Because plywood is wood, it is very corrosion-resistant. Plywood is an excellent material for handling fertilizers, manure, grains, vegetables, and many types of other farm produce. Farm buildings made out of plywood provide better thermal insulation value, are resistant to damage from impact, and generally provide a much better atmosphere for the animals.

We have only scratched the surface of potential plywood applications here, but undoubtedly you get an idea of the versatility of this material. It is this versatility and the fact that wood is a renewable resource which will keep plywood with us for years to come.

PLYWOOD AND THE INDUSTRIAL ARTS TEACHER

Now, many of you may be saying to yourself, "Plywood is an excellent material, but what does this do for me, the industrial arts teacher?" Well, at the beginning of the program, we introduced the American Plywood Association. The American Plywood Association is interested in providing you with assistance in acquainting your students with plywood, but we can also be of benefit to you by providing appropriate literature to help you teach your students, and, where appropriate, we can even present educational programs to your classes. Due to its limited staff, the American Plywood Association must limit such presentations to college-level courses or high school building trades programs, provided the building trades program is active and currently in the process of constructing a house or similar buildings outside of school property. While the American Plywood Association would like to provide training meetings for all interested classes, at all levels, time does not permit. Therefore, this criteria has been established for determining where plywood meetings can be held. But if your class does not meet the criteria, this does not mean that the American Plywood Association cannot help you. Over 300 publications describing plywood and its use can assist the industrial arts teacher at any level. This information can be obtained by contacting the American Plywood Association, 1119 A Street, Tacoma, Washington 98401.

Mr. MacLeon is a Field Services Representative for the American Plywood Association, Houston, Texas 77055.

Plastics Education in the Public Schools

Clyde M. Hackler

Activity in the area of industrial plastics can be found all across the country and at several levels in public education. A general over-view of the kind of activity that is taking place at levels such as vocational, technical institute, industrial arts teacher education, junior high, and senior high school programs is presented here.

In addition to these observations, some reactions are presented relating to what can be done in a school teaching environment in relationship to industrial plastics: tools, materials, and techniques.

VOCATIONAL EDUCATION

Activity in vocational education is scattered, with no definite geographical pattern appearing. A survey of state directors for vocational education conducted by one of my students, Mr. Carl Metcalf, during the summer of 1971 revealed that six states were offering programs of instruction in the area of plastics. Generally speaking, these programs offer instruction in areas that require a considerable degree of manipulative skill, as would be required in the area of tool and die making. An example of a vocational program that would not have appeared on our survey is the vocational program at Clearfield, Utah, operated by the Thiokol Chemical Corporation under contract from the OEO (Office of Economic Opportunity). This program is actually a part of a Men's Job Corps Urban Training Center established in 1966. The center and its programs must operate according to the guidelines for a job corp center.

The Clearfield center includes instructional programs in job clusters such as automotives, air conditioning, food services, agriculture, metals, medical, and vocational plastics.

Instruction in vocational plastics is further divided into four major areas, which originally included: molded plastics, which featured instruction in extrusion, injection molding, and compression molding; thermoforming and fabricating, which involved instruction in machine operation, trouble shooting, material characteristics, and quality control; instruction in the fabricating area included machining plastics and various assembly techniques; reinforced plastics included basically hand and spray lay-up procedures with different materials, and reinforcements; and pattern making for plastics processing purposes with the instruction centering in the area of plaster, wood, and reinforced plastics as media.

It is my understanding that the center has since dropped the thermoforming-fabrication and the patternmaking part of the cluster and are now focusing attention on the molding program and the reinforced plastics program.

TECHNICAL INSTITUTE (ASSOCIATE DEGREE)

There seems to be considerable activity at the technician development level. We identified approximately three times as many programs, and I am confident that there are considerably more. Mr. Robert J. Ullery, Secretary to the Plastics Education Foundation and former Education Director for the Foundation, recently indicated that more than 200 two-year educational institutions at the post-secondary level have made inquiry as to the need for program development in the area of plastics.

Instructional programs at the technical institute level do not seem to be arranged in any particular pattern in terms of geography. However, instruction does generally center upon understandings in the general areas of electromechanical and power technology, blueprint reading ability, plastics processing techniques with in-depth study of the processing variables, knowledge of materials (i.e., types and capabilities), and management skills.

In my judgment, programs at this level will continue to increase in numbers and grow to fill a vital link in industry's trained manpower needs. The Plastics Education Committee (the forerunner to the Plastics Education Foundation) found in 1968, through an industry-wide survey, that there is a serious shortage of trained plastics personnel in the processing industries. The committee indicated that this shortage is not regional, but nationwide, and it exists in direct proportion to geographical location of the present processing companies of all sizes. On an industry-wide basis, the processing goes on near where the plastic is actually consumed.

The survey also revealed that 97% of the respondents expect a continual shortage of trained plastics personnel for at least five years following the survey, increasing in direct proportion to the industry's growth.

One of the critical problems in this area, it seems to me, is the lack of trained instructional personnel to teach and administer programs of this type. If you employ practicing technical and engineering personnel for these jobs, they are usually lacking in teaching skills and background, whereas a professionally-trained teacher more than likely would be short on technical understanding and background.

INDUSTRIAL TEACHER EDUCATION

I have no evidence to indicate teacher education activity for the purpose of preparing teachers in the area of plastics technology for the vocational schools nor for the technical institutes. There does, however, seem to be a great deal of interest and activity in the area of industrial arts teacher education—i.e., preparing industrial arts teachers for the junior and senior high schools.

Runnalls (1965) found that 61 of the 203 institutions having industrial arts teacher education programs offered specific courses in plastics. Another 73 of the institutions indicated that courses were offered which included instructional units in plastics. A majority of the schools offering specific courses in plastics offered only one course. Only 14 or 22.9% of the schools required a course in plastics for their industrial arts teacher education majors.

He also found that those schools presenting courses in plastics used the Modern Plastics Encyclopedia and technical manuals as the most frequent source of content. General Plastics by Raymond Cherry was used most frequently as a source of content by schools presenting only units of instruction in the area of plastics. This alone gives you considerable insight regarding the type of content transmitted in the respective situations.

One additional finding was that the most common material used was acrylic. I rather suspect that this was the case because acrylic is plastic, and it is possible to make "individual utilitarian objects" otherwise known as projects by bending, twisting, screwing, gluing, buffing, fluffing, and tatooing.

I would like to see a study, similar to Runnalls, conducted at this point in time. For this study, I would hypothesize that a greater proportion of the industrial arts teacher education programs now offer one or more courses in the area of plastic, that the text book sources are changing, and that the actual content is more representative of contemporary industrial practices.

The Plastics Education Foundation listed 51 industrial arts teacher education programs that taught summer courses in the area of industrial plastics during the summer of 1971. This is only ten less than the number that was teaching during the regular year in 1965.

JUNIOR HIGH AND SECONDARY IA PROGRAMS

Junior high and secondary programs in industrial arts generally reflect what is going on in the teacher education institutions in practically all dimensions. That is, more and more junior and senior high schools are offering plastics, either as units of instruction within courses or as unit courses with one or 1/2 unit of carnegie credit assigned to the area. Ullery, in his report, indicated that twelve states have developed curriculum guides for the introduction of plastics courses in industrial education. We can soon add one more state curriculum guide in this area. Kentucky is now in the process of developing a curriculum bulletin for 11/3 carnegie units of credit in the area of industrial plastics. I have been recently contacting state directors for industrial arts, and many of those who do not have curriculum guides in this area have expressed an interest and have indicated that they are planning to develop a guide in the future. Ullery reports that in New York State, at the present time, nearly 45% of the junior high schools offer plastic instruction and 10 to 12% of the senior high schools offer a half or full year course in industrial plastics. As the numbers increase at the industrial arts teacher education level, so will the junior high and senior high programs increase in numbers.

A second major dimension is content. Although I think it is changing (evolution of textbooks is a strong indicator of this change) from a craft orientation to an industrial orientation, there are still a great many programs out there at this level and in industrial arts teacher education that center their content around the physical manipulation of acrylics.

A third dimension relates to pedagogical practices in industrial arts programs that are based upon the manipulation of media as the organizational structure of the curriculum. The so-called "project method" as it is employed in industrial arts is a long way from the classical project method envisioned by William Heard Kilpatric, and it is in many cases inappropriate as a teaching method for industrial plastics. The individual project construction technique seems to work in the area of wood working. However, I don't believe that it is the most satisfactory method to use even here if your purposes are to develop understanding related to the contemporary wood industry.

Think for a moment of those plastics products that are available that have been hand crafted from the acrylic. Sure, they can be found, but they do not represent any economic importance for the industry. Plastics processing in industry relies heavily upon machines, dies, and molds rather than hand operations in the production of products. These production processes should be reflected in our programs of instruction.

WHAT CAN BE DONE

I have related my impressions of what is currently going on at various levels of education across the country in the area of plastics. In my judgment, there is vast potential for development at all levels in the area of plastics education.

What can be done in a school teaching environment? My general response to a question like that is anything you want to do; that is, from the standpoint of developing understandings in the area of industrial plastics.

You simply say to yourself, I want my students to develop understanding about thus and so, and then proceed to devise plans and procedures for getting the job done. Many teachers get bogged in the implementation stage and assume that thus and so is impossible or impractical to teach at the junior or senior high school level.

Let me give you an example. Teacher X decides that he wants his students to know something about extrusion of plastics. Both teacher and students go into the laboratory and find no extruder, so the teacher says flatly that they will just have to wait until next year, when the extruder arrives. Next year the extruder is on board, but years of delay are necessary to accumulate required auxiliary equipment such as cooling systems and a variety of take-off systems. Finally they are ready, and realize that a die is necessary in order to make a project. As you can envision, this takes even more time, and hundreds of students have passed through the doors knowing nothing about extrusion of plastics.

I am of the opinion that an empirical experience with tools, machines, and materials in a well-equipped laboratory contributes greatly to a student's understanding of the sub-matter under consideration. However, a well-equipped laboratory is not an absolute requirement before learning can take place. A history teacher would be in a bad fix if they took the position that a first-hand experience was absolutely necessary before the student could develop an understanding of selected subjects in history. I could just see the classroom atmosphere when studying about Pickett's charge on the third day of the Battle at Gettysburg. It would be impractical for the history teacher to recreate or simulate more than a few of the historical events that may be studied and impossible to duplicate any of them. However, teachers still try to develop understandings in the area of history, and I'm sure they know full well that a teenager in 1972 could not develop the same kinds of understandings about the Battle at Gettysburg as a teenager who participated and survived the actual battle.

The point is that a highly developed and sophisticated laboratory is not absolutely necessary if you really want your students to learn about industrial plastics processes.

The second part of the example that I used related to a teaching methodology—that is, a "project," or more specifically an individual project. I have no strong burning desire to quarrel with those proponents who hold that the individual project is a suitable vehicle of instruction until it gets to the point that all instruction, in all areas, at all levels must employ this teaching technique. The individual project simply does not fit in many cases in industrial arts education. Because the project method is not a viable approach does not negate the validity of the content, but merely calls for a different approach to the situation.

There is an old saying: "Where there is a will, there is a way." You may not have access to the best way, nor even a good way, but it can be done, even if you must resort to the lecture technique.

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The Plastics Education Foundation Helps Bring Plastics Instructional Programs into the Classroom

Maurice Keroack

In late 1967, a task force representing both The Society of Plastics Engineers and The Society of the Plastics Industry completed a survey of United States plastics processing firms in an effort to determine the need for plastics education programs. The results of this survey were summarized in a widely-distributed pamphlet entitled, "The Need for Plastics Education." A major recommendation of this study was that the Plastics Education Foundation be formed.

The Plastics Education Foundation was subsequently chartered in the State of Connecticut and received its determination letter from the Internal Revenue Service indicating that the Foundation is exempt from federal income tax as an organization described in Section 501 (c) (3) of the Internal Revenue Code.

Co-founders of the Plastics Education Foundation are The Society of the Plastics Industry, Inc., and The Society of Plastics Engineers, Inc. The Society of the Plastics Industry, founded in 1937, now has over 1500 member companies. The Society of Plastics Engineers, Inc., currently has an individual membership of approximately 17,000. A Board of Directors representing both SPI and SPE governs the Plastics Education Foundation activities and programs. Approximately 50% of the resources of the Plastics Education Foundation are used for helping schools develop programs in plastics. This includes the junior high school, senior high school, two-year technical college, and four-year university programs. The remainder of the time is devoted to promoting in-plant training programs for the industry itself.

This is enough about the Plastics Education Foundation to give you some background and insight into the development and the goals of the organization.

The plastics industry recently observed its 100th birthday in America. Advances in the chemistry and physics of plastics processing have resulted in a phenomenal growth pattern during the last several decades. While the Gross National Product has increased an average of 4% per year during the recent past, the plastics industry production rate has increased by 15% per year subsequent to World War II. Applications of plastics products now permeate virtually every other industrial field of production, with largest tonnage in the construction, transportation, and packaging industries.

The value added to plastics material through processing exceeds by many times the value added to other materials through manufacturing operations. The volume of plastics material exceeds that of all non-ferrous metals at the present time, and it is projected that the plastics volume will exceed that of iron and steel by 1980.

The increased sophistication of plastics processing techniques makes imperative the development of plastics education programs at the junior and senior high school level, as well as vocational and technical education at both the secondary and post-secondary levels in the immediate future. The development of course offerings at the secondary school level is contingent upon the availability of teaching personnel with the capacity to offer appropriate instruction. It is imperative, therefore, that consideration be given in the immediate future to the addition of plastics course offerings in industrial teacher education institutions across the country. A recent survey reveals that a substantial number of industrial arts teacher training institutions will offer at least two- to six-week programs during the summer of 1972. Several of these institutions and others have regular course offerings in the field of industrial plastics. There remain, however, a significant number of industrial education institutions that fail to offer instruction in this vital field.

As previously mentioned, the Plastics Education Foundation was charged with the purpose of aiding the development of plastics education opportunities at all levels. With this goal in mind, the Foundation has produced a variety of teaching materials appropriate to levels ranging from grade 7 through teacher education and also has available a listing of appropriate films, one of which is specifically geared to career orientation in the plastics area. Additional services of the Plastics Education Foundation include the coordination of available surplus industrial processing equipment appropriate to the needs of educational institutions and a national awards program for students who excel in the study of plastics. As an additional service, the Plastics Education Foundation has produced a Plastics Education Guide. This publication consists of a variety of helpful information, including equipment lists, teaching aids, bibliography, sources of industrial education, free and inexpensive industrial literature, and other aids to assist educators. For additional information on the services offered by the Plastics Education Foundation, please direct your requests to Four Lorna Lane, Loudonville, New York 122:1.

The widespread use of plastics by all of industry insures continued growth, both in the industry and in its need for well-trained entry level employees. Plastics is a major industry deeply rooted in almost every type of manufacturing. It has displaced old established materials such as glass, metal, paper, and wood, but also has created entirely new markets in new product applications never before possible. Unlike many other industries, the location of plastics processing plants need not be geared to the availability of natural resources or to a large population center. The nature of the raw materials used in plastics processing and the weight-to-volume ratio of both raw materials and finished products are such as to make the location of plants feasible in almost any part of the country. As a consequence, many locations which were heretofore considered unlikely industrial development localities have recently experienced the growth of the plastics industry and the subsequent employment of many hundreds of persons in nearby, congenial, modern plants.

Plastics education is equally important to girls and boys at the early secondary level. No consumer will have been well prepared if he does not possess some knowledge of synthetic fibers and other products of industry which may have been manufactured through injection molding, blow molding, thermoforming, extrusion, compression molding, foaming, calendering, and reinforced plastics. The general education of anyone has been neglected if this information has been missing from his total education program. In recognition of this need for plastics education, the industrial arts program in all our public schools should certainly have a segment of plastics in them. This could be used as an introduction to processes and materials, and would certainly impart some consumer knowledge in the area of plastics materials and products to the students. With this in mind, I would like to devote the rest of the time to establishing a priority on how to establish a plastics program in a typical junior-senior high school situation.

The first step for the would-be instructor of plastics is for him to become technically competent. You would never think of setting up a metals program, a woods program, or a ceramics program without first feeling comfortable in the area to insure that the instruction you give is pertinent, correct, and that you are covered as completely as you could be for the safety ramifications of the processing area. The same thing applies, of course, to the area of plastics. The two basic approaches to obtaining this technical competence are either by self-teaching methods or by attending a university where teacher preparation segments also include technical courses in plastics. Of the two methods, the self-taught method, of course, is the hardest, but many times it precipitates a top-quality program because of the dedication that a person must have to follow this route to become technically competent.

During the time spent on acquiring competency or immediately after when you feel comfortable in talking the particular language common to the plastics industry, it is suggested that you contact your local section of The Society of Plastics Engineers and talk with the Education Chairman designated in that section to help emerging plastics programs. This is an invaluable source of personal contact that will contribute much to your setting up of the program and the acquisition of free or inexpensive equipment and material. If you have not done so before, this would be a good time for you to contact the Plastics Education Foundation and see of what service we can be and what literature we have available to help you in your development. Another source of natural materials are other teachers offering programs at the same level as you are. By sharing our curriculum materials in a new and developing area, we can learn from one another to develop programs that offer the best features of each.

It is suggested that the next step after proceeding this far would be to identify the areas you feel appropriate to your situation, keeping in mind the amount of technical competence you have acquired at this point, the amount of money that you have to work with, the amount of space available, the age level of the students, and the number of students that you will be dealing with at one time. You should establish and identify the areas that you are going to begin with, those that you are going to grow with, and those that you would like to include in order to have a complete program at the end of your development period.

An invaluable source for this is the New York State Experimental Resource Unit in Plastics, which not only identifies the areas but gives sample lesson plans for demonstrations and related information in each of the areas and also identifies the equipment and the free or inexpensive literature available in each of the areas.

Once you have gone this far, if you have not already been organized to the point where you are developing your courses on paper, this would be an ideal time to do so. Because of the multitude of materials and processes common to the plastics industry, it becomes imperative, especially for a new teacher, to develop course outlines identifying the major technical concepts that he wants to present, the names and properties of plastics materials common to that process, and the development of the products to be manufactured to exemplify the product and the materials. This will also give the teacher an opportunity to further develop reference materials for both the students' use and for his own development. If at this time you would like somebody to critique the course outlines that you have developed, please forward them to the Plastics Education Foundation; we will be more than glad to look them over and make appropriate comments.

Only at this point are you ready to identify equipment that you will need. So often in industrial arts courses the equipment comes first, and then the program is geared to the equipment that you happen to have. This is kind of putting a cart in front of a horse. It is imperative that materials, processes, and products be identified before equipment is selected. Equipment development in the past few years has been very favorable to the small school need. The Plastics Education Foundation now has available a catalogue of small equipment for each of the areas that a typical school program should cover. There are several used equipment reconditioning organizations that offer used equipment at a reasonable price. This listing can be found in the Modern Plastics Encyclopedia. If you have been fortunate in making contact with your local Society of Plastics Engineers section, you might inquire of its membership if there is small equipment available in the immediate area that is surplus to the local industry and that they might be willing to donate or place on extended loan in your school. A word of caution here. Make sure that you inspect the equipment before buying it and that you are technically competent in the area of machine selection, so that you will buy the size and type that will best fit your program. The tendency here is to buy or to accept donations from industry of too large equipment, which creates all kinds of problems when it is time to make molds and to buy materials to produce parts. After you have developed your specification for equipment and would like someone to critique it to see if it is a reasonable request, please send your equipment report to the Plastics Education Foundation; we will be more than pleased to look it over and make suggestions as to its appropriate size and tradenames. Just as in the automobile industry, there are Fords and there are Cadillacs in the plastics industry equipment; there are also some lemons. We will try to steer you where we know other teachers have had good luck.

It is now time for you to beg, borrow, steal, or purchase the materials needed for the equipment you have specified. If you deal with basic resin manufacturers and basic materials manufacturers, you will most likely be able to live for the first year or two of your program on donations of raw materials from the industry. Your best source of information for leads to the companies who are prevalent in the plastics industry is the Modern Plastics Encyclopedia. By contacting companies listed in that publication, you will be well on your way to receiving materials for your program. Materials for the plastics area need not be an expensive item in your budget if you plan well and are willing to send letters and make contacts with the proper companies.

Develop one area at a time, with the molds, machines, and materials necessary to make that area operational. This tends to work well in your own development, usually works in well with budgetary requirements, and allows for a long-range planning program for the dollars that are available to you. Many teachers have found this technique successful, especially if you include your students in the development of the program. Junior high school students are very imaginative and tend to identify with plastics products rapidly. Although their manipulative skills might not be all that you require, they certainly can help in the development of molds, reconditioning of equipment, and developing products.

If you have developed and followed these last seven steps, you will now appreciate the statement that you must be dedicated in order to develop a new program, but if you have shown this dedication and have developed this program, the dedication should start paying off now. Once you have established the program, or once you have set up one or two areas that are working well for you, let people know what you are doing. Write articles for IAVE, School Shop, and the rest of the other school publications. Send copies to the Plastics Education Foundation, and we will do our best to get the articles printed in the trade magazines. These trade publications are always interested in news from educators. Glossy prints to supplement your articles are always welcomed by editors.

The intention of this presentation is to try to set up a logical sequence developing a program in the area of plastics education. Most teachers who have followed this sequence and have made the commitment to develop a program have been successful. A lot of the success was due in part by the ease of the area to be learned. There are a few basic obstacles, such as terminology of some of the materials with long names, but once this is overcome the fun of accomplishment, the ease of instruction, and the rapid acceptance of the students to this area make it all very worthwhile.

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M/S/T Forum

A Consortium of Industry and Education for the Improvement of Industrial Arts Education

C. Dale Lemons

Ecological imbalance, violence, production, depleting energy reserves, overpopulation, unemployment, wasted human potential, cost of living increases, population mobility, loss of identity, drug abuse, pollution—terms among many currently being used to express dissatisfaction with technology and the use of technology in our society. An equal number of terms could be given to express the benefits that we enjoy as a result of technological development. In short, there appears to be strong conflict in opinions about the positive and negative effects of technology on man and his society. You witness daily various attempts to escape the super-industrial society in which we live—anti-materialist groups, mystical cults, communes, reversion to by-gone eras in clothing, music, games, furniture, etc. This nostalgia may appear to be only a fad, when in fact it represents an urge to return to a simpler life.

Others attempt to function on a philosophy of nowness. Advertisements, songs, and life styles exemplify the "now generation." The demand for immediate gratification has pervaded college campuses, high school campuses, politics, minority groups, and has touched all segments of our society.

Neither identification with the past nor locking-in on the present are viable alternatives. In this complex, super-industrial age, the only alternative is to control or apply technology for the benefit of man. The forum project was founded on the premise of converting problems of technology to benefits for man. That is, it was felt that to use technology effectively it is necessary to develop what I shall refer to as technological literacy.

Further, in compliance with accepted definitions of industrial arts, the development of technological literacy is a concern of industrial arts. From Frederick Bonsor's definition, "a study of the changes made by man in the forms of materials to increase their values and of the problems of life related to these changes,"[1] to more contemporary attempts to define our discipline, there is reflected in some manner a responsibility for studying about the problems related to industrial and technological activity.

With varying degrees of success, we have given attention to the study of industry and technology, but little in industrial arts has been done to examine the resultant problems. Understanding the relationships between technology and society for the purpose of making rational decisions about the use of our technical knowledge is what I am defining as technological literacy. Dr. John McKetta, in his presentation to the MAN/SOCIETY/TECHNOLOGY Mideast Forum, stated the charge in this manner: "All I ask is that you, because of your position and your ability and your knowledge in technical areas, provide calm, honest intelligent information to your groups so that they can, when decisions are made, make the intelligent decision."[2]

In this presentation, he was referring in part to industrial arts educators developing appropriate and correct concepts about technology in our society. It was with this primary focus that the MAN/SOCIETY/TECHNOLOGY Forum Project began.

PURPOSE OF THE FORUM

Many misconceptions about the M/S/T forum series have been aired across the country. There are those who have criticized the project because they thought it to be an attempt to start a new innovative program. Others judged the effort an attempt to move toward a more "academic" study and away from an activity-centered study. In both cases, as with other false notions about the purposes of the forum, these concepts are in error. In fact, the purposes of the forum project were so simple and fundamental that they were suspect.

The brochure which was sent to all AIAA members at the beginning of the forum series spells out clearly the purposes of the forum. I would like to elaborate on these goals.

First, it was stated that the forum was to examine the promises and problems of technology as related to man and his environment, with the focus on improvement of industrial arts programs and industrial arts teacher education. These promises and problems were not defined as being technical in nature but were broadly identified as social, cultural, economic, and environmental concerns. Improvement of industrial arts programs was the primary goal for the industrial arts educators, but it was recognized that the participants would each have primary goals different than those of the profession. Therefore, emphasis was focused upon the concern for man and his environment—a common concern for all participants.

Second, in order to accomplish the first goal, dialogue had to be initiated and developed between industrial arts educators and others in education, and they in turn with persons from other segments of society. To be more specific, organized segments of our society were to be invited from the broad categories of government, labor, industry, and education. These groups were charged with analyzing the promises and problems of technology to extract implications for education.

Third, each forum was asked to analyze critically the goals of industrial arts, to establish more clearly and firmly the relationship of industrial arts and technology. This task actually was to accomplish two purposes—that of communicating to participants the objectives and ambitions of industrial arts education and that of soliciting critical evaluation from the participants. For many participants, the first in-depth discussion of our discipline to which they had been exposed occurred in the forum. The impact of this exposure I will discuss later in this presentation.

The fourth goal was to synthesize the promises and problems of technology with industrial arts education. It was anticipated that the broad representative mix of leadership personnel interacting in the forums would challenge the profession with startling new concepts about our role in the education of youth. However, I believe it would be fair to say that many of the forward thinkers in our field have already surpassed the collective recommendations of the forums. This is not to minimize the value of the results of the forum project. As I will enumerate, many fine observations and recommendations were made—most of which were basic and fundamental; actions were called for to which we have given lip service but little else.

In the accomplishing of these goals, certain outcomes were expected. All outcomes did not result to the degree that was hoped for, but I feel that it is better to set high goals and have to stretch than to set them too low and stoop. Among the outcomes expected were

1. To establish an interdisciplinary base of labor, industry, government, and education to work more effectively on the promises and problems of technology.
2. To compile a list of resources to be utilized by faculty and students in industrial arts teacher education and the K-12 school program.
3. To develop a plan for implementing in each state an educational partnership to coordinate and utilize available resources effectively.
4. To develop recommendations for improving industrial arts programs and teaching at the elementary, secondary, and collegiate levels.

These were realized in varying degrees of success. Although not all results can be reported here, a portion of this presentation will be devoted to results of the forum.

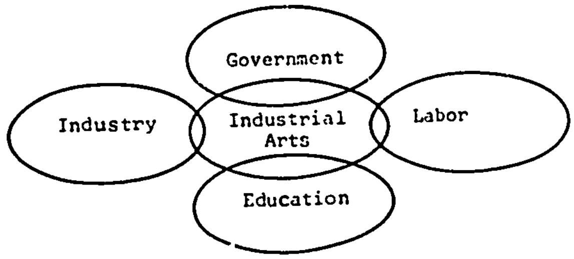
To accomplish the ideals as presented, it is imperative to have a plan that has a fair chance to succeed. Next I would like to review with you the design of the forum or, if you please, the strategy.

STRATEGY

The strategy of the forum project is quite simple—that is, to identify and involve leadership personnel from many segments of society in an interactive situation, around a topic of common interest, to expand thinking, create interpersonal relationships, and result in improved educational programs. A model of this strategy might appear as a number of overlapping circles where each circle would represent the world of concern and resources of a given segment of society. (Next page)

The amount of overlap represents areas of common interest and a basis for communication and common effort. I realize that this model is inadequate to effectively illustrate all possible combinations of common interests; however, I hope the concept is clear.

Although the premise of identifying and bringing together persons of high caliber, leaders in their field whether in industry, government, labor, or education is a simple one to think and state, the accomplishment of the task is quite complex. There are many factors that affect the success of such an endeavor, of which planning is the most important.



In this planning, the following are key points to which attention should be given.

1. ORGANIZATION—the organizational structure of personnel to attend to the many varied tasks of conducting a forum. In the series of regional forums, this organization consisted of a Project Director, a Program Director, eight Regional Coordinators, and ninety-eight State Coordinators (two from each state). Each operational level had specific duties which were important to the success of the venture.

Project Director. The Project Director had the responsibility for managing fiscal matters and consulting with the Program Director.

Program Director. The Program Director was responsible for identifying Regional and State Coordinators, informing them of their responsibilities, deadlines, goals, and mechanics of operation. He also identified speakers, locations, and other key individuals; this was usually done in consultation with the Regional Coordinators. Continued communications with all coordinators, preparation of program materials, invitational materials, and task assignments were all a part of this responsibility. Individual letters of invitation to all recommended participants as well as follow-up correspondence was handled through the office of the Program Director.

Regional Coordinator. The Regional Coordinator had a very difficult task. In addition to acting as a stimulator to State Coordinators in his region, his responsibilities included making local arrangements with regard to housing, transportation, food, meeting rooms, recording equipment, registration of participants, and whatever local favors or information might be available. One of the most difficult tasks befalling the Regional Coordinator was that of soliciting financial support from outside sources to help defray participant costs, and I must say they did a fantastic job. The Regional Coordinator's responsibility did not end with these arrangements, but also included summarizing the forum proceedings and continuing to maintain communications and encouragement to his State Coordinators.

State Coordinators. The State Coordinators were key individuals in the success of a forum. It was their responsibility to identify the leaders in their state who would be interested in this endeavor, have input for the forum, attend, and interact with others for his state and other states. As the forum concept was centered on interaction between people, the type of individual involved was important. If you do not think that identifying leadership quality people from many different segments of society is difficult, try compiling a list of 25 significant people equally distributed between government, labor, industry, and education. The State Coordinators also functioned as discussion leaders and recorders in the forums and were charged with continuing to serve as leaders in promoting similar action within their respective states.

2. PROGRAM—the selection of the topic of concern to a broad spectrum of our society is very important. A challenge must be exhibited to interest those who can be of significant value. Also, the plan of operation within the program must provide variety and at the same time opportunity for involvement of all participants.

3. PERSONNEL—the speakers chosen and the content of their presentations can focus the participants on the topic or divert them in other directions. It is imperative that speakers be chosen carefully and that they understand clearly their role within the program. Speakers were chosen to stimulate thinking rather than provide answers.

4. LOCATION—the site at which a forum is held and the physical arrangement of the rooms can be conducive to interaction or can seriously impair the forum action. Any site considered should be seriously examined with the strategy of the forum program as the criteria for selection.

5. COMMUNICATIONS—throughout all stages of planning and conducting of a forum,

it is imperative that communications be clear and continuous. At best, communications are difficult, but when communication must be made between persons with widely varied backgrounds and different interests and concerns, the task of clearly transmitting concepts is multiplied significantly.

6. COMMITMENT—all staff personnel involved in the forum must be committed to the effort. Nothing generates action more than enthusiasm; therefore, it is imperative that those in contact with participants radiate enthusiasm and optimism.

To sum up the strategy, it starts with a goal, such as to gain support from other segments of society, and then through careful planning create a program that will bring together creative people in an atmosphere conducive to constructive action.

IMPACT OF THE FORUM: PEOPLE

There were many benefits resulting from the forum series, the most important of which I judge to be the new friends made for industrial arts. In one way or another, the forum touched many people. In the eight regions, 926 persons were actually invited to participate; however, numerous others were formally or informally contacted. An analysis of persons invited and participating show the following statistics.

Government	131 invited	60 participated
Labor	68 invited	17 participated
Industry	297 invited	80 participated
Education	179 invited	71 participated
Industrial Arts	178 invited	172 participated
Students	28 invited	22 participated
Others (PTA, Civic Organizations)	45 invited	9 participated
TOTAL	926	431

Statistics, of course, only reveal quantitative data and do little to reflect the quality of individuals and the degree of impact made upon them. Even those who did not, by choice or because of conflicting schedules, participate in a regional forum were made aware of the concern industrial arts has for technology and society. This contact in itself can be significant.

To speak briefly about the quality of participant, let me give you a sampling of the type of individuals from each category.

- Government
  - State Senator
  - Administrative Heads from State Government
  - Mayor
  - Federal Agency Heads
- Labor
  - Labor Commissioner
  - Union Officials, State Level
  - Union Officials, Local Level
- Industry
  - Presidents of companies
  - Presidents or officers of industrial organizations
  - Personnel Managers
  - Chamber of Commerce officials
  - Educational Supervisors of industry
- Education
  - Superintendents of Public Instruction
  - Assistants to Chief School Administrator
  - University Professors of other disciplines
  - College Presidents
  - Local School Superintendents
- Students
  - Students of industrial arts on high school, college, and graduate levels
  - Students other than industrial arts—the quality of which I illustrate by an example.

One young lady from a medium-sized high school who had been elected as president of a state youth organization participated in one regional forum. Her involvement in the forum was so significant that at the final session she received a standing ovation from all participants. You can believe that this young lady will be a spokesman for industrial arts, although she had never taken a course.

Other

State and Local School Board members and chairmen

State and Local PTA officials

In addition to regular participants, many of the speakers became thoroughly convinced of the value of industrial arts. Among these, there were a few who deserve special mention.

Dr. John McKetta, E. P. Schoch Professor,
The Texas University, who was the general
session speaker last night.

Mr. Boardman Moore, Facilities Planner
Chevron Research Corporation
Richmond, California

Mr. Ivy Lee, Jr., Executive Vice-President
Northern California Industry-Education Council
San Francisco, California

Mr. J. Lee Hamilton, Vice President
National Association of Manufacturers
New York, New York

Admiral (Retired) Charles Horne, President
Industry-Education Councils of America
Pomona, California

In addition to these outstanding individuals, the Educational Programs Officers of NASA centers should be recognized for their effort and tremendous support of the forum project. Dr. Fred Tuttle, Director of Educational Programs, NASA, Washington, D.C., provided leadership and support throughout the entire project and has become a strong advocate of industrial arts. Time does not permit me to name all of the NASA personnel involved in the project, but if you should desire to work out an educational program that concerns current technology, do not fail to contact the nearest NASA center to ascertain what input can be provided.

While I am recognizing the contributions of people, I must give recognition to some of the companies that supported the forum series, not only in personnel but also with financing. Some of these are quite familiar names to you and have a record of supporting our field.

Charles A. Bennett Company—four forums
Brodhead-Garrett—all eight forums
Scott Engineering Sciences—seven forums
Philco-Ford—three forums
Rockwell Manufacturing Company
Cope Plastics, Inc.
Tandy Leather Company
Frank Paxton Lumber Company
Automobile Manufacturers Association
Associated General Contractors
Fairchild Industries
Enterprise Machine Tools, Inc.
DeVry Industries, Inc.
Graves-Humphreys, Inc.
Electronic Aids, Inc.

There were others, largely local establishments, that provided favors and other financial assistance. To all of these, our appreciation is deep.

INPACT OF THE FORUM: ACTION AND IDEAS

Next I would like to share with you a few significant outcomes of the forum in the form of ideas and actions. The ideas sometime take the form of challenges or charges to our field, and the actions are continuing efforts to establish consortiums for the improvement of industrial arts.

As the forum series progressed, it was soon learned that we were not unique in trying to promote cooperative and partnership efforts to improve education. A number of industry-education cooperation councils were discovered in operation, but industrial arts educators had not been involving themselves. A number of Community Resources Workshops have been conducted in various parts of the United States in which industry and education cooperated to make education more relevant in today's world. But, again, industrial arts teachers had not involved themselves. This, to me, represents a major challenge. We profess to teach about industry and the technology of industry but do not avail ourselves of the opportunity to associate with the element which we claim as a source of subject matter. As one participant of the forums stated it, the industrial arts teacher must get out of the lab occasionally and get involved in the community. This can accomplish two things; he can find out what is happening, and he can spread the good word about the contribution of industrial arts to the education of youth.

Speaking of spreading the word, a recurring observation in all of the forums was that the public relations efforts of industrial arts teachers were very poor if not nil. As Boardman Moore put it, "You must tell the public what you are doing for their children." The need for an organized, effective, and active public relations effort was made vividly clear in each forum. This is a challenge to every industrial arts teacher and more pointedly to state and local industrial arts organizations.

Perhaps the most often and universally agreed upon outcome of the entire series was the need for industry and education to cooperate to improve education. This was viewed as two-way proposition where each would support the other. Further implied was the need for interdisciplinary studies—interdisciplinary in the broad sense which would include the community as well as academic disciplines.

At this time I would like to read to you a grocery list of statements made that have implications for, if not direct charges to, industrial arts. These statements are selected from various forums and are intended to give you merely a sampling of the forum activity.

Provide for the exposure of technology to pre-school children and continue it throughout life.

Develop within the pupil a positive attitude toward change and the acceptance of it.

Energy sources and uses are not infinite, and technology can create an unreal or false sense of security.

Educational facilities must and can be used more effectively.

Pupils must understand the economics of our society.

What values and ethical goals could form the common denominator of a technological society to provide all people with a quality of life?

Schools should develop curricula that place more emphasis on "doing" rather than abstraction.

Colleges must break the "for young people only" syndrome and become centers of continuing education for people throughout their lives.

A study of technology must include not only the technical dimensions of technology, but also the role of man and his relationship to a highly technological society.

There is a crying need to eliminate waste and to use by-products more effectively.

Should we think in terms of large content areas with a more comprehensive education rather than specialized content?

Education must cause young people to develop the ability to make intelligent judgments concerning materialistic things.

Schools should prepare every child for leisure as well as for occupational competency.

Educational technology, including multi-media and multi-activity instruction, must be used more effectively.

Industrial arts, like many areas of education, has taught courses in isolation from the public and even from other educators and disciplines.

Place less emphasis on the subject name and image and greater emphasis upon the results desired from the program.

These are but a few of the hundreds of concerns and recommendations expressed. Where these represent the combined thinking of people from many segments of our society, I think it wise to give serious attention to the message.

The question might well be asked—okay, it sounds fine, but how? A few states have already made attempts to find out. Arizona and Pennsylvania have held state forums to touch base with local leaders and get them into the act. Several other states have devoted their annual state association meetings to a MAN/SOCIETY/TECHNOLOGY discussion and planning session. In other states, individuals and groups have begun to actively participate in industry-education cooperation councils.

The possibilities are limited only by the imagination and the willingness of individuals and groups to work, which brings me to the last segment of this presentation.

WHERE TO FROM HERE

The question has been repeatedly asked, "Of what benefit has the forum been to the classroom teacher who must daily enter the laboratory to teach a group of students?" It can be of significant value when the message of industrial arts is clearly communicated to the public to gain support for improved programs. When a legislator, a school board member, a city official, an industrial leader, a labor leader, or an interested citizen knows what industrial arts can do to help people understand and cope with the technological society in which they live, an expensive program may appear much less expensive.

The Regional Coordinators and the Directors of the project met in Washington after all eight forums were completed to evaluate the results and make recommendations for further action. Several categories were identified to which attention should be given: funding and legislation to promote the discipline; identification of outside resources; organization of industrial arts personnel; planning of activities; and planning of instructional programs. While these may seem vague at the time, reflection on them will reveal that these are the areas where we have been weakest.

To help state and local industrial arts organizations, the AIAA will be printing guidelines to aid in the planning and operation of forum programs. Also, several articles and publications are planned to bring to the membership the results of the regional forums.

All in all, the Forum Project has been a successful venture—many new friends have been made, and many of our practices have been challenged. I, personally, have benefitted greatly from the experience and plan to continue working to promote a consortium of industry and education. Let me end by saying, get involved—but plan well and think big. Don't just ask an aide for support; ask the Governor, the company president, or the State Superintendent of Public Instruction. Be open, sincere, and willing to listen as well as speak out.

FOOTNOTES

(1) Frederick Bonser and Lois Mossman, Industrial Arts for Elementary Schools (New York: The Macmillan Company, 1942), p. 3.

(2) John McKetta, in an address ("Technology—Promises and Problems for Man and His Environment") at the Goddard Spaceflight Center, Greenbelt, Maryland, November 15, 1971.

Dr. Lemons is Professor and Chairman of the Department of Industrial Education, Murray State University, Murray, Kentucky.

Needs of Industry

The Industrial Arts Graduate in Industry

Ted S. Jones

I am going to speak on my own experience as an industrial arts graduate, as a former industrial arts teacher, and as a Director of Industrial Relations who travels to colleges to recruit graduates of all disciplines. I can only speak for recruiting in Texas, and I hope the other states have had better experiences. If I were not an IA graduate, people in this major would not even be interviewed by my company. As a matter of fact the title of my talk to the college group tomorrow is entitled "Industrial What?" This is not a case of you people turning out a non-desirable product, but rather that our so-called parent, industry, does not relate to the title industrial arts and is unaware of our existence in most cases. I have been asked to cover several areas, and I will subject you to my opinions of being a nonperson a little later.

The first question I will address myself to is, "What does industry expect of the IA graduate?" in terms of several categories. First is the actual academic requirements. I am speaking now of the college graduate who does not intend to teach, but who hopes to enter industry of some kind and have the background to absorb the training and knowledge that industry offers him. By having the IA knowledge, by applying himself, and by adding the particular knowledge acquired through and required for that industry alone, he should then theoretically advance up the management ladder. Before I vaguely throw a curriculum at you, let me tell you I have IA people employed at Mosher Steel Company. I have industrial technology and industrial education graduates also employed. Every one of these people are performing duties formerly staffed by engineers, so the product you are turning out now is far from an undesirable one. The IA graduate can successfully perform the basic functions of an engineer if he has basic engineering math, basic science (preferably physics), drafting, and the remainder of our present IA curriculum. I am not excluding the degree requirements such as English, history, and so on. We want college graduates, not technicians. The main thing I want to beg of you is do not, please do not, exclude the actual lab courses in favor of engineering academics. A prime factor that makes IA people valuable to industry is the practical, as well as academic, experience. Teach them to work with wood, plastic, and, of course, steel. Instruct them in production methods, and then let them try it.

My next requested topic was how compatible is the terminology of industrial arts with that of industry. My answer is, it isn't. What I will now say has removed me from more IA speaking lists than we have people in this room. To the personnel man, or recruiter, or normal company executive, industrial arts means an artist. The word "crafts" means a group of husky boys in a shop making billfolds. For that matter, using the word "shop" removes the course completely from academia. Woodworking means lamp making, and most of the executives of today remember when most of the shop students were the less intelligent or undesirables. Industrial technology means a two-year course at a trade school. Technical education implies an exotic trade school like electronics. In short, we have a terrible communication gap. This is where you as a nonperson industrial arts teacher must carry the ball. Get out into the community you live in and sell our concept. Ask the local carpenters, plumbers, electricians, or merchants to come and talk to your classes. They have probably never been asked before and will be flattered to be included in education. While you have them there, give them an IA pitch, and explain that we are teaching the basics of life—how to earn a livelihood. They can identify with us much better than the more academic departments. Speak at club functions if that's your bag. "If the student hasn't learned, the teacher hasn't taught." If IA is not sold, you haven't been selling. Get out and meet industry. You'd be surprised how eager they are to help.

The last two items on my list I intend to skim. The question was asked, "What are the prospects for employment of IA graduates in the next 10 years?" and the same question regarding minorities with an IA degree. To the first I would say, that depends upon you. If we can re-establish contact with industry, the opportunities are limitless. Remember, most engineering colleges have eliminated practical shop work. IA people are desperately needed to bridge this gap. If we can re-establish contact, the opportunities for minorities in the IA field are even better than non-minorities. Most firms have what is called an Affirmative Action program. This program says that that company will go out and affirmatively seek minorities for areas such as management or engineering, if they are deficient. Minorities with IA degrees could expect to be besieged. All this depends on re-establishing contact with industry so they will know who we are and what we have to offer.

The second question I intend to skim was "Are industrial arts graduates given intelligence, aptitude, or other tests upon entering industry?" I can only answer for the steel industry in Texas, and the answer is no. Pre-employment testing is pretty well squelched throughout industry because of the Supreme Court's decisions on Equal Employment Opportunity. Actually, I consider them rather academic. If you had the perseverance to stick out college and the intelligence to graduate, industry needs you.

In conclusion, let me beg one more item. Teach these students the attitude of honest work. Only those who take pride in their work, show loyalty to their employer, and work hard will make it to the top. These people will make it because you will have taught them how, in academic work, practical work, and by inspiration.

Mr. Jones is Director of Industrial Relations for Mosher Steel Company of Texas and Louisiana.

The Place of the Industrial Arts Graduate in Industry Today—And in the 21st Century

Billy J. Armstrong

Before one can properly assess what the nature of industry might be by the year 2000, he should consider what life will be like in 28 years. First, recall the state of affairs 28 years ago (1944) and, knowing today's standards, assume an exponential growth of three to four times the same progress. The following developments are thus forecast:

1. Transportation
   - Individual computer-controlled local transportation modules
   - Suborbital distant transportation
   - Underground tubes bored by nuclear devices
   - Shuttle service to the moon
2. Communication
   - Wrist watch communication with anyone—anywhere
   - Home computer module for billing, income tax, records, or information storage
   - Information banks for researching any subject instantly
3. Food
   - Ocean farming may supply 75% of foodstuffs
4. Housing
   - Plastic modules
   - Undersea living
   - Lunar residences under atmospheric domes
5. Services
   - The economic sector employing the greatest number of workers will feature:
     - A. Education - individualized computer learning techniques
     - B. Health - computerized diagnosis and prescription
     - C. Energy management - nuclear, solar, oceanic thermal energy conversion
     - D. Recycling - refuse separation and processing
     - E. Recreation - Packaged programs for additional leisure time, vacation trips to the moon, jet-set visits to Mars
6. The last area to be forecast, Industry, influences and will be influenced by the above. The following trends currently indicated in industry will be highly developed in 2000:
   - A. Tape-controlled manufacturing processes—automatic operations
   - B. More plastic structures formed in place (cars will be 75% plastic in 2000)
   - D. Bonding - replacing mechanical fasteners and gaskets
   - E. Recycling - more modular parts, designed to be discarded when bad and recycled
   - F. Tooling - extensive use of plastics, ceramics, investment casting
   - G. Cutting - computer graphic milling machine - operator can cut metal with a light pen on a screen

H. Noise - better design of machines to reduce it
I. Controls - use of fluidics and continued advancement of solid state devices for higher reliability
J. Composites - high strength-to-weight materials using a wide variety of fibers and matrices
K. Concrete - lighter, stronger, more widely used in all types of construction
L. Planning and production - decisions made by computers based on management objectives - instant management status reports, resulting in higher productivity, production monitored via closed circuit TV

What training will the industrial arts graduate need to be ready for these innovations? He will need foundations in the following: electronics, computer science, control systems, design criteria, plastics, composite technology, systems management, noise management, refuse reclamation, and pollution control.

In summary, the industrial arts graduate coming into industry in the 21st century must be more scientific/management oriented, and he must know a little about a lot of things to be prepared for a place in industry.

WHERE ARE INDUSTRIAL ARTS GRADUATES DISTRIBUTED IN INDUSTRY?

Most industrial arts departments conduct regular surveys to determine current job assignments of graduates. I am sure that most of you professors know how many of your graduates are in education and what percent are working in business and industry.

In all probability, most of you have found that many of your graduates have left teaching or did not select that field when they graduated.

As a sample involvement in industry by the industrial arts graduate, I have selected a fairly large aircraft company in the Dallas-Fort Worth area.

Recent Survey of Aircraft Industry

1. The company had 16,200 population.
2. This survey did not include vice presidents, directors, or managers; only professional and supervisory level people.
3. 3,853 professional jobs in company.
4. 2,306 with Bachelor's degree. Unlike education, we have many fine employees who have not completed their degree.
5. $\frac{123}{2,306}$ or 5.4% of all degree professionals were industrial arts graduates. Of this 123, 97 (79%) held professional-level jobs with an average of 12 years' experience and were making $14,300 average income. Another 26 (21%) were supervisors with an average of 18-plus years' experience, making $19,200 average income.

The placement of the 123 by department was as follows:

Department	Total	Percent
Accounting	2	1.6
Engineering	53	43.1
Industrial Engineering and Facilities	10	8.1
Industrial relations	8	6.5
Manufacturing		
Manufacturing Engineering	23	18.8
Manufacturing Controls		
Materials	6	4.9
Program Management	3	2.4
Sales		
Field Services	18	14.6
Quality Assurance		
Total	123	

From this distribution of industrial arts graduates in industry, it is safe to state that an industrial arts graduate would fit well into any major department of any company. This survey indicates, however, that his education and personal interest might be more directly related to jobs in the engineering and manufacturing departments. Specialization and advancement will depend upon his attitude, continuing studies, self-development, and application of all of these toward a specific goal.

WHAT EFFECT DOES JOB OBSOLESCENCE HAVE ON EMPLOYMENT, TRAINING, AND ADVANCEMENT OPPORTUNITIES FOR THE INDUSTRIAL ARTS GRADUATE?*

Job obsolescence refers to a situation in which the individual's knowledge is insufficient to perform the specific technical tasks that he is required to accomplish in his current job.

Professional obsolescence exists when an individual's viewpoints, theories, concepts, or techniques are less effective than others in his field of specialization.

Some form of professional obsolescence is likely to exist in almost any individual—what is important is the relative and comparative degree. Only comparisons between individuals can be meaningful. Each of us is becoming obsolescent in some way each day—some more than others.

Now, let's look at obsolescence from a slightly different angle. According to News Front magazine, more than one-fourth of the nation is engaged in education, either as a teacher or student.

This "knowledge" industry accounts for nearly one-third of the entire economy and is growing twice as fast as the rest of the economy.

U.S. business spends 17 billion a year to educate personnel, or one-third as much as it spends on public and private schools.

We have all seen statistics about the dollar value of an education. Chase Manhattan Bank states that an income of those educated is equal to a return on investment of about 10%; this means that an investment will nearly double itself every seven years.

These facts not only show the importance and value of education, but also emphasize that we must continue our education in order to protect our investment.

For the first time since 1893, the United States may import more than it exports. For over 25 years we have been the technological giant of the free world; but within the past few years, many of our industries have been forced to close because their product could not compete with an import. In comparing products that we buy today, you will discover that much of your budget goes to imports. Products such as automobiles, clothing, motorcycles, sewing machines, office equipment, sporting goods, and electronics are just a few that are changing American industry.

It is easy for us in management to say, "It's all labor's fault; labor is too high," or "The union will put us out of business." This may be partially true, but management, labor, government, and education are all playing on the same team, and we're not winning very many economic games today. One wonders what part, if any, of this "economic slippage" is due to professional obsolescence. Now the big question: "What can we do about it?"

Here are a couple of ideas that we could try: specific technology groups could be "mass innoculated" with a "state-of-the-art" patent medicine. There is doubt if even that would cure all of us. The professionals could unionize and demand a full-paid sabatical, with tuition and fees for education and self-development purposes. But chances are that neither of these plans would work too well.

In order to prevent obsolescence, we must create an environment which will stimulate employees to willingly learn and change. Rewards must be used to implement such a program. Some of the rewards would be: base salary increases on courses or programs completed; make promotions based on job performance and improved self-development; provide opportunity to use newly acquired skills; provide time off to become involved with other experts; and increase one's sense of personal security within the organization.

Extremely critical to any anti-obsolescence program is the fact that it must be tailor-made for each individual. The man and his manager should be best qualified to design his program. Some of the activities in which one might become involved that will help combat obsolescence are: on-the-job training, special assignment or projects, task force or committee membership, job enrichment with additional responsibilities, in-company training programs—as student or instructor, university undergraduate and

*September 1971 Personnel Journal by N. J. Horgan and R. P. Floyd, Sun Oil Co., "An MBO Approach to Prevent Technical Obsolescence."

graduate programs, active membership in professional societies, specialized courses in new techniques and management skills, personal development courses such as listening, reading, writing, speaking, etc., and, in the language of our students, help each one "find your own bag" and learn to "do your own thing" better. Make some personal goals and strive to reach them.

Dr. Thomas Stelson, Head C.E. Dept., Carnegie Institute of Technology, provides some good food for thought about obsolescence: He warns that a man out of college for 10 years must devote at least 10% of his time to learning new things or he will be unable to compete with more recent college graduates. He predicts that tomorrow's manager will spend at least one day each week in full-time study—perhaps at home using an electronic console feeding him P.I. courses on videotape or other media. Most managers will return to a university for one full year twice during their business career. He foresees that short courses and seminars will be innumerable.

Higher education should be planning to expand curricula to include seminars which will help prevent obsolescence in graduates as well as in their faculty.

WHAT CAN THE INDUSTRIAL ARTS GRADUATE EXPECT FROM INDUSTRY IN TERMS OF PAYMENT FOR ADDITIONAL TRAINING, GRADUATE STUDY, OR EDUCATIONAL LEAVE-OF-ABSENCE?

This question was intentionally left until last. We have discussed the nature of industry in 21st century, the distribution of industrial arts graduates in industry, and the effect of job obsolescence on employment, training, and advancement. It leaves little to say about the rewards industry will make for these previously mentioned "anti-obsolescence" activities. However, most companies do make provisions for the training, education, and development of their employees. It is these programs which we will attempt to describe.

At the present time, the starting salary of a graduate with a master's degree will be about $75 to $100 more per month than one with a bachelor's degree. This does not mean, however, that if an employee receives an advanced degree while working full-time, he will automatically receive a $100 increase. This policy varies with companies. On the other hand, an employee who receives a bachelor's degree while working full-time will probably be reconsidered for another position, if he so desires.

Most companies provide and encourage their employees to enroll in undergraduate and graduate programs at local universities. Normally, there are provisions for full or partial tuition reimbursement. A company or facility will usually arrange time off for professional people to go to school or will have the university provide courses on-site. Undergraduate as well as graduate cooperative programs often serve this need. A cooperative education program allows employees to attend school and work alternate semesters until graduation. There are many benefits to cooperative programs which our company has enjoyed some 40 years. I will be happy to provide you with information on this program if you are interested.

Companies who require specialized skills, techniques, procedures, or special technical courses may provide them at no cost to the employee. The academic level of these courses may range from vocational school through graduate. Certificate programs requiring several courses are highly recognized by management.

Many companies provide several types of programs that will allow an employee to do graduate and undergraduate work. These programs may include part-time study, TV courses on company time, evening courses on campus, full-time graduate scholarship programs, and educational leave-of-absence programs. Doctoral fellowships may require three to four years' leave-of-absence.

Technical and management development seminars of all types (and costs) are provided for select employees. These seminars may range from a four-hour program in-plant to a 52-week program off-site. An employee selected for a White House fellowship spends one year in Washington, D.C.

Professional employees are encouraged to be active in their respective professional society. A company usually will pay for one membership in each professional organization to which a number of employees belong. Most companies support financially and technically the preparation and presentation of technical papers by their employees to state, national, and international meetings. Engineers are encouraged to get the state professional engineer's license and accountants to pass their C.P.A. exams.

A large number of companies provide four-, six-, or eight-month company orientation and familiarization through a job rotation program. This program helps a recent college graduate to learn about the company products, its policies, procedures, people, and organization in a relatively short period of time. This is an expensive, but very practical program. My company now has many top officials who came up through this program, including several vice presidents.

Many companies provide several award programs for ideas or improvements that make a safer operation or save the company money. Professional employees are constantly in demand to participate in the local and state education programs by being technical advisors, lecturers, teachers, and acting as tour guides for educational groups.

In summary, there is no end to the number and types of programs that companies will make available to deserving employees.

Mr. Armstrong is supervisor of education operations, Vought Aeronautics Co., Dallas, Texas.

What Does Industry Expect of Industrial Arts?

W. A. Kistler, Jr.

I know that I am expected to say that industry expects the school system to turn out people with some saleable skill so that they could move directly into productive jobs. I find this to be shortsighted, and it does not give recognition to the true long-term needs. I do not feel that short-term solutions are in the best interest of society; therefore, I propose to address my comments to longer-term needs in the hope that in time we can meet both the long- and short-term requirements.

I think you will find my comments in essential agreement with the Proposed Rationale for Industrial Arts in Texas. However, some of my thoughts on the ways to get there may be considered revolutionary and radical. I will, therefore, try to stay away from "how to get there" aspects in my comments and confine my remarks to the desired results.

I find that I am unable to separate industrial arts from our total school system. I must address myself to the subject of What Does Industry Expect of the Public School System? In this way, maybe I can come back to the role that industrial arts can play in the total system.

Earl Nightingale, in this record The Strangest Secret, says: "Your job, regardless of what it may be, holds within it the key to success and abundance." "You and you alone determine the degree of your success." "Man is what he believes he is." "Men must never forget that there is no substitute for self-reliance, individual striving, and thrift to provide for their needs."

There are more scientists, engineers, and educators alive today than the total of all that have lived before. Because of this, new knowledge is being developed faster than ever before, and some say that knowledge doubles every five years. The student who goes to college and takes a five-year course under our present program is likely to be obsolete when he graduates and will have to be retrained in his selected field before he can be productive.

We must recognize that education is not some final destination at which we arrive when we receive a certificate or diploma. Education is a continuous journey through life, and there is no end of the road. Each of us, however, is free to choose when to get off the road and park and let the rest of the world pass us by. A diploma should only denote that the student now has the basic learning skills to start this journey.

Each man and woman entering the world of work today will have to be retrained in four new jobs or skills during his or her work life. New jobs and skills required by new technology are being defined every day. Today's youth must be prepared for change, for new and undefined skills and technology that will become a factor of their future. A student fresh out of vocational school or high school with the basic manual and mental techniques may find a job and earn a living. However, ten years from graduation, when his job has been replaced or eliminated, what is he going to do? For example, look at the railroads. They are in serious trouble and almost out of business because firemen still want to fire steam locomotives and telegraphers want to send data by Morse Code, when the steam locomotives have been replaced by diesel electric engines and the teletype has been replaced by computer-to-computer communication.

To cope with our changing world, we need to direct our school curriculum to more basic approaches to knowledge. We need to provide facilities that teach how to learn, how to live, and how to communicate. A recent article in the January 1972 issue of the Conference Board Record, titled "Reforming Public Education," defines needed redirection to our school system. This article is based on a study of what business executives think of the current system. The system, they say, should make a greater effort to keep pace with a rapidly changing world, to take account of the basic needs of the world and especially the world of work, to strengthen vocational education, and to generally give greater emphasis to basic educational skills, such as reading, writing, and simple mathematics.

The following passage is credited to "Deschooling Society" by Ivan Illich (New York, Harper and Row, 1970).

> Illich's major argument against schooling in general stems from the confusion he finds between process and substance. He believes that the student is "schooled to confuse teaching with learning, grade advancement with education, a diploma with competence, and fluency with the ability to say something new. His imagination is schooled to accept service in place of value." This in turn causes the breakdown of essential services.

To further describe the direction that I believe is needed to prepare for the changes of the future, I quote from an article by Dr. J. Kestin, titled "Creativity in Teaching and Learning," from American Scientist May-June 1970.

> When we think about the problems of higher education, we are too often carried away by the frequent use of the active verb "to teach." With very few exceptions, students are not taught by their professors in any direct sense. Teaching is not the transfer of knowledge or understanding from the brain of the instructor to a number of brains which belong to students. A higher education must be acquired by learning. Achievement in learning is the result of an intensive, solitary struggle of each individual with himself.

Some of the most educated and most knowledgeable people I know never completed the sixth grade, and I might add that some of the dumbest have a PhD. I don't mean this to reflect the average or to be an indicator of how I think industrial arts can help industry. I only state these opinions to illustrate a point that skill and knowledge are an individual accomplishment, not a product of our school system.

Our programs must be directed at the individual and prepare the individual to be self-reliant. We must provide a proper attitude and motivate the individual to want to learn.

Why are so many of the youth today anti-industry, anti-business, when it is industry and business that they look to for jobs, for taxes to support government and public institutions? Why is it so difficult to understand that the whole system—business, government, schools, and society—are bound together, each supporting the other, and if any one fails, they all suffer?

Could it be that the attitude of youth is a reflection of some of this frustration of our school system? Could it be that the realization that less than 30% of the current high school output continues to college—the specified goal of the current system—and that 70% of the product is considered failure by these standards?

In private business, if less than 30% of the output were successful in the market place, the business would be a failure and eventually go bankrupt. Business must be productive to be profitable and survive. Therefore, I propose that the public school must also be productive to survive. The school must, like business, look long-range to the future market for their product and not be caught making buggy whips when all the buggies are in museums.

The public school system is now headed for bankruptcy because the productivity is at an unsatisfactory level. More money and more effort applied in the same direction cannot change the inevitable result. We cannot solve our current problem by patching up with better industrial arts curricula or better vocational training programs. We must look at the very basic objective of the system and build on sound concepts to provide a product that can survive in the changing times ahead.

We must provide learning facilities (not teaching) to give youth basic learning skills to be self-dependent in the world outside. These facilities should be staffed with learning coordinators, not teachers. Only by developing the individual student to be self-reliant and self-dependent with a true image of himself and the world can we provide that individual with security.

Curriculum studies may be good, but they get so involved with the design and content and the promotion of a department that we forget the true objective for which the curriculum was intended. All math departments want to have a curriculum that includes more math courses, and, therefore, make their departments more impressive and important and require more math teachers. I could say the same thing for any other academic department: industrial arts, vocational, agricultural, etc. I could also say the same thing about government and bureaucracy, and include many private companies. We get so imbued with our own objective that we forget the true purpose that originally started us on our journey. Since all school teachers went to college, we assume that everyone should go to college. And within each academic department, we think that all of the better students should major in our selected field of study.

We must forget the self-service partisan approach and get back to basics. We must stop the departmental infighting, such as the one that rages between vocational education and general education. What are we really trying to do in the public school system, and what is it all about?

One of the finest programs in public school systems that I have heard about was discussed by Dr. John W. Letson, Superintendent of the Atlanta, Georgia, School System. In his talk to the Houston Chamber of Commerce in 1970, he stated that they had to throw out the curriculum study approach. After each study by the various school departments, they kept coming up with from 14 to 27 years required to get in all of the courses required for high school graduation. They now design the course to fit the requirement of the student and make the subject matter relevant to what the student wants to learn; the existence of a textbook is not a prerequisite.

How many courses are there in our curriculum that cover learning (how to learn), study (how to study), listening (how to listen and gain knowledge), communication (how to impart knowledge), or philosophy of life (What is success? What is happiness?)? You know that the man who wants, really wants, to be a service station attendant and is a good attendant striving to be a better attendant is just as successful in life as the doctor who wants to be a doctor. There is no greater failure than the doctor who really wants to be something else.

Industrial arts should provide full insight into the following areas: Jobs—work—productivity. How jobs are created? Why do we have jobs and places of work? How much does it cost to create a new job, and where does this money come from? How to select your own personal goal in life?

Provide the background to condition the students to change, and be sure that they expect change. There are only three sure things in life, and they are Death, Taxes, and Change.

To summarize, I would like to quote Luker, in discussing the role of economics and technology in the industrial arts curriculum:

> A crucial policy guideline for what the industrial arts program should do in this area is given by the forces of technological change. Because of technological change, no curricular program can hope to offer training which will guarantee necessary skills for a lifetime. Specific skills which may become obsolete are no more predictable than the nature of future technological change. In developing competency in the job market, then, the focus of the industrial arts program should be to prepare the student for change. The economic content of this preparation involves a three-pronged program: It should provide insights into the forces underlying the demand for workers; it should provide insights into the processes of changing supply and demand and of changing job opportunities; and it should provide adequate and up-to-date statistics on present and future job opportunities.

Beware of statistics. You know that statistics are like bikinis. What they reveal is suggestive, but what they conceal is vital.

Let's prepare people for life, not put them out in the world with a tag that says "Machinist, Class 1972" and in very small print: "Warranty free from defects in material and workmanship for 90 days. There is no guarantee expressed or implied related to the performance of this product if used in an environment or with equipment not specifically defined during the time that this product was being manufactured. Further, any alteration or modification will make null and void all previously stated warrantees and guarantees."

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What Does Industry Expect of Industrial Arts?

Ed C. Burris

The term "industrial arts" doubtless means different things to different people. Webster's Dictionary says:

> Industrial arts is a subject taught in elementary and secondary schools that aims at developing a manual skill, a familiarity with tools and machines, or an acquaintance with industrial processes and design.

So that we may be on common ground, I have determined to basically develop my remarks upon this definition, since more than 70% of our youth who enter school never attend school beyond the high school level, and it's from this 70% that the majority of the work force must come. I recognize that many of you teach at higher education levels on a much broader, more precise and technical basis, but I shall leave that for others to discuss.

No one person can presume to speak for all industry throughout the nation. From the narrow spectrum of my own experience with the business leaders of this state, the subject assigned could well have been, "What does industry expect of education," since industrial arts is but a small part of the whole, and it's the impact of the total process that molds the reactions, if not the character, of the child.

We in business think the main thrust of the whole educational process has been pointed in the wrong direction for some time. It has been directed primarily toward preparation for college, even though less than 30% of beginner students ever enter an institution of higher learning and a much smaller percentage ever finish. As a result of these and other related factors, many youngsters, aware of this truth, lose interest in school, drop out, and become a burden instead of contributors to society. Recent satellite television from the Republic of China revealed that occupational training in that nation begins at an early age; thus, from a vocational point of view, their educational system appears far more realistic than is ours. This lack of realism in our system has caused industry to expect little, even though we desire much in the vocational education field.

To pursue this point, let us examine Texas as an example. The Texas Education Agency, in an annual report entitled "Programs for the Disadvantaged" for the school year 1970-71, revealed that the Texas Public School system had 1,187 school districts with a total enrollment of 2,803,771 students.

For the purpose of this special study, they selected 243 of the larger districts with a combined enrollment of 1,438,820 students.

In these 243 districts, 72,978 graduated from the secondary school in that year, which was approximately 65% of the average enrollment in the 12 grades. This indicated a substantial drop out, but no precise figures were given.

The agency made a follow-through study on the graduates of that year and found that 52.5% were attending college, another 5.9% were taking some sort of post-graduate training, 5.7% were in the armed forces, and 19.9% were employed, leaving 16% unaccounted for.

Thirty-eight percent of the total graduating class took some form of vocational training at the secondary level. Of this number, 23.3% were employed, but only 8.9% were employed in the area of their training.

These data seem to indicate a need for vocational guidance and training at the elementary level, and better counseling as to vocation selected at the secondary level. The same is probably true of every state and nation represented here.

We believe the major purpose of public school education should be to equip, through proper training, the youth of the nation to earn a living and to concurrently teach them that work, any productive work, is honorable and essential to progress, and that progress is essential to survival. The student should also be taught that each person has a responsibility to support himself and his dependents through work. Or, more succinctly, we believe that schools should teach skills and, while doing so, seek to instill the basics of economic understanding and proper work attitudes to the maximum extent possible.

To develop and retain the proper attitude, a person must first have a basic knowledge of the private competitive economic system and how it works. He needs to comprehend the position of his employer within that system and the part he plays as an individual employee. It is difficult to appreciate and develop the proper attitude toward something one does not understand.

To provide proper instruction in this area, the teacher must first understand the system. Unfortunately, several surveys made in recent years reveal that most teachers do not. The same is true of their product, the student, at every level of education, including college graduates.

To illustrate, let us review a few of the high spots in a recent study of the Opinion Research Corporation as disclosed by Thomas W. Benham, its president, before the White House Conference in Washington on February 7, 1972.

The survey revealed that 53% of those with college training believed that government controls were essential to keep prices at a fair level. Fifty-nine percent of high school graduates shared that opinion, as did 69% of those who had not completed high school.

More amazing is the fact that of those included in the study, the median of opinion was that manufacturing profits after taxes equaled 28% of gross sales. In truth, as revealed by the Federal Trade Commission and the Security Exchange Commission, such profits were only 4% of sales. This disparity between opinion and fact has existed for a long time, but the gap is increasing. The spread was 12.8% in 1945; it's 24% now.

The survey also disclosed that 66% of those included believed that companies could raise wages 10% without increasing prices. In fact, such an increase, without a sustaining increase in prices, would virtually wipe out all profits, and would soon destroy many industries and ultimately all. This is so because wages in the total production process consumed 90% of corporate revenue and profits only 10%.

The study also disclosed that 37% of the public believed that workers must produce more if they are to increase their standard of living, while 34% think that all they need to do is get more of what the company makes.

This disparity between opinion and facts is not conducive to proper attitudes and forebodes a more difficult road for the "job maker"—the employer—and probably decreases job opportunity. Such economic ignorance can only be overcome through an all-out effort in which you, the trainer of future workers, can most assuredly have a major part. But the total educational system must become involved if the effort is to succeed.

This survey, or opinion poll, portrays that students need to be taught the importance of productive effort and to understand that increased productivity is basic to any continuing increase in real wages. This is so because all wages, at every level, in every occupation, must eventually be covered by the price of products. There simply is no other source from which real wages can be secured for a very long period of time.

I emphasize the importance of understanding and attitudes because I realize as do you that skills, irrespective of quality, are of little value unless the possessor thereof is willing to use them in the interest of himself, his employer, his family, and the public, and that with relatively few exceptions, vocational training in school must be supplemented, probably several times, by on-the-job training by industry before the employee can be fully equipped to effectively discharge his full responsibilities in a technical society. This is also true because school shops are not equipped to totally train a person to meet the technical needs of the various potential employers in an ever-changing industrial complex. You in the schools can teach the basics essential to understanding which will ease his task, shorten his on-the-job training period, and make him more employable.

There are literally thousands upon thousands of vocations in the varied and complex economy of this nation that require different and varying degrees of skill to perform. You cannot teach the simple basic rudiments of all, but each of you can teach the importance of attitude, effort, and performance. Far too many of our school graduates today, at all levels of education, think the dirtiest four-letter word in the American vocabulary is WORK.

We as a people, as teachers, must change this attitude if the nation is to progress—and hold its rightful place among the nations. The want ad section of the newspapers in my town, and probably in most such papers of the nation, have column after column of ads seeking employees, not all of which require high skill; yet unemployment is allegedly at a high level. Why? There must be something wrong.

More specifically, with respect to occupational or vocational training, industry would like to see a more frequent updating of school programs so as to keep them in tune with employer needs and job opportunity in our ever-changing economy. We also believe a more intensive effort should be made by school counselors and teachers to guide and persuade students to acquire the employable basic skills needed at the time and in the area where they live. This, I fear, is not now being done on a broad scale.

Let me illustrate what I mean by the need for updating.

In 1970, there were 78,627,000 persons employed in the nation. Of this number, only 3,123,000 worked on the farm. I have no nationwide information with respect to vocational training, so must again resort to Texas data on the assumption that its experience will be illustrative of the national picture as a whole.

In Texas, agriculture as a source of employment has been on the decline for more than 40 years, and the decline continues. During that period, non-agriculture employment has moved steadily upward. Even so, the thrust of our vocational training programs has been substantially the same.

In 1930, when this state had a population of 5,800,000, there were 744,000 people employed on the farms. The population has doubled since that time, while the number employed in agriculture has shrunk to an annual average of only 286,000. Included in this average are 120,000 migrant workers who are employed during peak seasons, most of whom would not be available or eligible for vocational training in this state. These facts are mentioned as a background for your thinking when I say vocational training needs updating.

In 1962, ten years ago, approximately 350,000 were employed on the farms. Texas then had 1,135 teachers instructing 46,603 students how to be better farmers. By 1971, the numbers employed on farms had shrunk to 286,000. Even so, in that year 1,203 teachers were instructing 54,378 in the arts of the trade.

Now, let's look at the other side of the coin. In doing so, let's eliminate homemaking, not because it's unimportant, but for the reason that most such students are not taking the course for the prime purpose of using their skill in the channels of commerce or entering the employment market.

In 1962, non-agriculture employment in this state approximated 3,200,000. To meet the needs in this field, there were 450 teachers instructing 18,312 students in the various trades. By 1971, some 4,236,500 were employed in non-farm vocations, and 2,703 teachers were instructing 81,102 students in the arts of the various trades. Some improvement—yes; but infinitesimal as compared to the growing need. Quick calculation reveals the program is still pro-agriculture and that the ratio of other training to non-agriculture jobs available is not very realistic.

Figures are not available with respect to the various skills needed in manufacturing and services trades. Should they exist, I am fearful they would be even more dismal.

Educationally, the nation is seemingly in a rut. A restudy needs to be made of the total process. Non-essential subjects, of which there must be many, need to be discarded so that funds would be available for the job that needs to be done in the vocational field. This would be a painful and difficult task. There are too many professionals with vested interest in out-dated subjects, but it will eventually have to be done. Curriculums cannot forever continue to expand to meet the need and accommodate desires. There are not enough funds available. An expansion in occupational or vocational training is a must. It is of prime importance. It is essential if this nation is to keep its place in the sun.

In the vocational field, some reorientation is necessary as well. It is now, as I have indicated, comparable to driving an ox cart in a jet propulsion age. It must be updated to become more in tune with needs. This is what industry wants and, I believe, has a right to expect.

That brings us back to the beginning. To be a good citizen, to enjoy living, one must first be able and willing to earn a livelihood. Good citizenship should be our goal. You as instructors in this field are doubtless pursuing this objective, but there are not enough of you. I commend you for your effort, the contribution you are making, and hope that your numbers will be greatly expanded in the years ahead.

Mr. Burris is president of the Texas Manufacturers Association with home office in Houston, Texas.

Power

The Energy, Power, Instrumentation, and Control Technology Component

Anthony J. Palumbo

The purpose of this presentation is to define the technical component called EPIC and to describe the typical student activities that evolve from EPIC study.

If you desire a comprehensive rationale for the study of Energy, Power, Instrumentation, and Control in Industrial Education, see the 1970 AIAA Convention proceeding: "EPIC—An Important Segment of Instruction in Industrial Arts."

EPIC (ENERGY, POWER, INSTRUMENTATION, AND CONTROL) DEFINED

EPIC technology is the study of the anatomy of, the control of, and application of machines. EPIC technology curriculum is an applied study of mechanization (the application of a machine to do work) and cybernetics (the application of control systems to machines).

When control is applied to a mechanism, the process is converted to automatic operation, and the result is an automated machine. In essence, EPIC may be defined in two words: "applied automation."

EPIC AS A TECHNICAL COMPONENT

EPIC becomes a relevant technical component when one realizes the dependency of modern society on automated devices. Modern man is literally "hooked" on automation. Consider an attempt to exist in your present environment without the assistance of EPIC technology. This technical knowledge has made possible the advancements of our standards of living; i.e., from witchcraft to artificial organ transplants; from primitive Pete's hammer to mammoth excavating machines; from the abacus to the electronic business computers. Today, EPIC technology becomes even more important as we seek a remedy for machine defecation (pollution). Only EPIC technology will find a solution for pollution. It would appear that without a thorough understanding of this technical component, automation may overpower mankind.

THE EPIC CURRICULUM—ACTIVITY-CENTERED

Educationally, the study of automated systems as conceptualized in EPIC has relevancy in the elementary, middle, junior high, high school, and post high school programs. We believe a most successful program is operating in the Department of Industrial Education and Technology at Bowling Green State University.

The EPIC curriculum offers an entry-level course derived from a unique concept system that is designed to give all students an exploratory experience. This system illustrates the basic machine anatomy. Student activity in this course is as varied as their occupational, recreational, and exploration interests.

For example, a person interested in manufacturing systems might automate a drilling operation. A person interested in communications might experiment with a teletype or a radar. A person interested in solving air pollution might experiment with LP gas engine conversions. The common thread that allows for these activities is that all machines are derived from the same anatomical system. Therefore, it does not matter with what machine one works; they are all EPIC systems, and experience with any machine will instill the basic principles needed to understand the concepts of mechanization and cybernetics.

For those students who desire to "major" in EPIC or who desire to learn more specific talents in an EPIC-based field, the curriculum offers the concentration-level courses. Courses have been developed in the following concentrations: Electrical Power Transmission, Fluid Power, Energy Converters, and Electronic Logic Systems for Computers; courses can be developed in as many concentrations as demanded by the students. Such concentrations might be: Instrumentation and Control, Mechanical Power Transmission, Computer Interfacing, Radio Communications, and a host of others. The common goal of these courses is to give students experience with performance analysis on specific systems. These courses are system-oriented and utilize the experimental approach to facilitate learning.

Finally, those who specialize in EPIC technology are placed in synthesis courses, where they are required to apply newly-learned talents to real problems.

In these courses, the EPIC students work with the manufacturing and design graphic students to solve real problems. These experiences normally result in the designing, construction, testing, and modifying of machines to accomplish a specific task. Synthesis studies have been completed on injection molding, compression molding, competition engine modifications, blow molding, miniature dune buggy, competition garden tractor, and many others.

SUMMARY

The purpose of this presentation was to define EPIC and to describe student activities in a new and emerging curriculum field. EPIC, the study of applied automation, is a technical component vital to modern man.

The EPIC curriculum contains a unique concept system to give all students an exploratory experience, a specialized experimental concentration, and a developmental synthesis experience.

Considering EPIC technology is an all-encompassing field; it does not matter on what machine or field a student works. The EPIC curriculum will give the student the basic principles needed to understand the concepts of mechanization and cybernetics, the necessary talents to work with specific systems, and the practical experience necessary to successfully "apply automation."

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Power—Power Technology: Decisions, Decisions...

Thomas P. Olivo and Jay L. Webster

From blast-off to recovery, as millions viewed each lunar probe, each of us has recognized the awesome "power" of power to control man's destiny. On the seas, new vistas of exploration in man's quest for survival through hydrospace activities and new cargo-carrying capabilities reveal man's dependency on power. On land, the search for new means of mass rapid transportation and, at the same time, the fight against air pollution has focused public attention upon new methods of developing, controlling, and using power. Aside from these auspicious uses of power, the average citizen deals subtly with the power that is harnessed in the design, tooling, production, and servicing of each product or commodity. The average person, however, seems to have a modicum of understanding of the forces defined as power.

The common knowledge which is basic to man's understanding of his environment and his socio-economic survival is an intrinsic part of an industrial arts program. Power is basic to all man's work, studies, and understandings about himself—on land, in outer space, and in the depths of the oceans. Power is an inevitable part of an enlightened industrial arts program.

Recognizing the need and yet aware of current inadequacies in most instructional programs, this paper traces the historical concerns, positions, problems, and research on power. Recommendations are formulated for a program of action.

HISTORICAL CONCERN FOR POWER INSTRUCTION

The first movements in the direction of power instruction occurred in the late 1930's. In his discussion of the Mississippi Valley Conference, Barlow reports the action of a 1936 meeting of the Committee on the Six Fundamental Shop Courses: "The 32 members present voted for eight subjects to be recommended for the 7th, 8th, and 9th grades."[1] "Power" was included in their list.

The first evidence of an organized research study in power was a master's thesis in 1937 by Bowers.[2] Bowers proposed a course in "General Power Mechanics" for the junior high school. This proposed course of study advocated an understanding of power development and utilization as a significant factor in the progress of an industrial society.

In the 1940's, industrial educators became interested in developing a new and broader curriculum base for industrial arts. Attention to this approach was given in an article by the American Industrial Arts Association in a statement of position concerning the American program of industrial arts. The new definition for industrial arts is described as:

> Content, in the new industrial arts curriculum, is derived socio-economically from the technology and not by job or trade analysis from the commoner village trades such as those of the carpenter, the blacksmith, the cabinet maker, and so on. Now the subject matter classifications are conceived of as including: (a) power (tidal, solar, atomic, electrical, muscular, hydraulic, combustion); (b) construction (housing, public works, industrial, national defense, . . .); (c) transportation (land, sea, air); (d) communication (graphic arts, electrical, other media); and (e) manufacturing which includes the basic industrial methods of changing raw materials into finished products such as foods, textiles, ceramics, metals, woods, plastics, and leathers, similarly but broader in concept and application than the so-called "general" shop of the past 30 years.[3]

The trend toward acceptance of power as an industrial arts subject field is indicated in the bulletins published by the American Vocational Association. Prior to 1953, auto mechanics was outlined as one of the 18 subject-matter fields which were the most common programs of industrial arts. General power mechanics was listed as one of the possible additional content fields.[4] In the 1953 bulletin, auto mechanics was not included, but the area of transportation and power was developed as one of the 12 general instructional areas recommended at that time.[5]

The present status of power is difficult to determine. Status studies on power have concentrated mainly on the college level. The 1971-72 Industrial Teacher Education Directory identifies 88 power programs at the college level. There are few comprehensive status studies of power at the secondary school level. Most state departments tabulate and report only enrollment levels.

PROBLEMS IN POWER

Research attention must be focused on several pressing problems which inhibit program development. One problem centers upon a rationale for power instruction. When asked, "Why study about power?" industrial educators have responded with a wide range of answers. In 1934, Smith and Wittick[6] advocated a power program aimed at providing the student with consumer information. Rationale proposed by committees of the AIAA[7] and AVA[8] stress the impact of power in the development of an industrial society. Still another thrust is developed by Feirer[9] and Risher.[10] These writers point to the importance of power as a program which can unify unrelated elements of industrial arts instruction.

A clear definition of terms is basic to any kind of program development. A great deal of confusion exists over the terminology used in this area. Terms may be used interchangeably or may be used to identify varying approaches. What is power mechanics? What is power technology? Where does transportation fit in? Is it a component of the automotive curricula or a separate content area? In the 1963 AIAA publication of Industrial Arts Education,[11] the terms automotive and power are used interchangeably. A statement formulated by the AVA declares that "Power Mechanics is the study of power, motors, engines, and vehicles."[12] Other definitions are much more narrow, based upon energy sources or the effects of power. Clearly, there is no precise, commonly agreed upon definition for instruction about power.

Differences in definition and purpose naturally lead to differences in content. An examination of course guides and syllabi leads one to the conclusion that there is great diversity of practice in power instruction. If all the current practices are synthesized, four practices are in evidence: courses organized around the small single-cylinder piston engine with token consideration given to alternate power sources; courses organized around types of engines . . . piston, jet, etc.: courses organized around sources of power . . . chemical, electrical, etc.: and courses based upon the nature of associated jobs in industry.

THE TIME FOR DECISION . . . SOME POSITIVE ACTIONS

Out of this accumulation of concern and knowledge, a number of obvious needs have emerged. These could be resolved by considering the following program of action for further study, experimentation, and research:

A consortium of leaders representing the best thinking of "power experts" should meet in a national forum to deal with major facets of power technology. The American Industrial Arts Association or the American Vocational Association should provide a natural vehicle and a central focus. The deliberations of the leaders should result in yardsticks for evaluation; defining of innovative activities; the development of guidelines on the relevance, scope, and place of power technology in industrial arts as an integral part of the total educational program.

Workshops and clinics of the "Consortium" should resolve such issues as: accountability of industrial arts for this important part of the total learning of all youth and adults; establishing purposes and anticipated outcomes in the contest of industrial arts' role in the common learnings; suggesting content and model courses where power technology is one of the vital industrial arts learning areas; identifying added needs for planning, development, and research.

Following the national convocation on power technology, smaller groups of leaders may be organized to work in depth throughout the year on such major concerns as:

a. The development of model courses of instruction at whatever levels of instruction the content applies in the elementary, middle, and upper secondary grades;

b. The planning and evaluation of instructional materials and "software";

c. The preparation of educational specifications to define the physical learning environment of plant and "hardware" (for carrying on the shop/laboratory/field activities);

d. The human resource aspects relating to students and student selection, occupational exploration, and the services of guidance and counseling.

e. Finally, assessing all of these forces, another group would relate to industrial arts teacher education and the curriculum for teacher preparation which truly considers program totality and power technology as an inseparable part of industrial arts.

Statewide and school district evaluation studies should be designed, using the national "model" as a comparison. This study would provide program developers and especially teacher educators with the data to bring about needed changes.

A study should be designed to measure the impact of available software (textbooks, films, lab manuals, etc.) on program development. The results of this study should provide suggestions to publishers engaged in producing such materials.

A study should be designed to measure the limitations hardware (tools, equipment, etc.) places on program development. This study should provide suggestions to equipment manufacturers regarding deficiencies in the field.

Articulation studies should be initiated at both the college and secondary school level. These studies should determine the relationship of power instruction to the areas of automotive, science, and engineering.

THE WAY IS CLEAR

"Power . . . Power Technology; Decisions, Decisions. . . ." The time is NOW! The responsibility and contribution of industrial arts education to upgrading the socio-economic-citizenship capabilities of our people will be circumscribed only by our professionalism to think big in the context of totality, to consider sound alternatives, and to move decisively with all the daring at our professional command!

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The Status of Power Mechanics in the 70's

Jay Webster

What is the status of power mechanics as we enter the 1970s? In order to find out, a national study of power mechanics was conducted. Data were collected on a wide range of topics from over 1,000 power mechanics teachers at the junior high, high school, and college level in 47 states across the country. The study was aimed at providing the kind of descriptive data required for sound program planning, determining if power mechanics is in as great a state of confusion as the literature suggests, gaining some insight into needed improvements in power mechanics teacher training, and identifying problems in the field so that further effort may be directed toward their solution.

WHAT IS POWER MECHANICS?

Since the 1930s, a substantial portion of the industrial arts literature has been devoted to proposing and promoting curricula for power mechanics courses. During the 1960s, leaders in the movement have called for a broad survey approach to the study of power, one which considers all types of power sources and their effects. The leaders suggested that many courses called power mechanics were, in reality, a study of the small single-cylinder spark ignition engine. Teachers were asked what definition of power mechanics they favored in an effort to determine if differences in content are due to differences in definition.

When the data were analyzed, it was clear that power mechanics teachers at all levels define power mechanics in broad terms. Almost half of the teachers defined power mechanics as a "study of energy sources and machines that convert energy into useful work." Another broad definition, "A study of the development, transmission, and utilization of power," was also favored heavily. More limited definitions such as: "A study of the automobile powerplant," and "A study of land, sea, and air carriers" received a very limited response.

WHAT ARE POWER MECHANICS TEACHERS TEACHING?

In order to determine what is being taught in courses called power mechanics, teachers were asked to respond to a list of curriculum topics, to indicate the emphasis they currently place on these topics, and also to report what emphasis they would desire to place on the topics in an "ideal" program. The junior high instructional program is essentially a small single-cylinder engine program. Only two other topics were at all popular at this level, compression ignition engines and automotive engines. The high school program is primarily centered upon the automotive engine. The single-cylinder engine is also important in the high school program. Two other topics, compression ignition engines and mechanical transmission of power, were also popular in high school programs. The college-level program emphasizes a much broader approach than the secondary levels. Automotive engines are also popular at this level, but topics such as heat energy and the mechanical transmission of power were emphasized nearly as much. Single-cylinder engines were not nearly as important at this level as at the high school or junior high level.

It is possible to infer from the data above that, in terms of content, there are really three different power mechanics programs, all operating under the same definition. The junior high level emphasizes the small gasoline engine, the high school level emphasizes the automobile engine, and the college program is a broad survey approach to power sources.

The same list of topics was used to determine what the curricular emphasis should be in an "ideal" power mechanics program. The desired program at all three levels would be a good deal broader than the one currently offered. Jet engines, measurement of power, gas turbine engines, and compression ignition engines would be important in an "ideal" program. The small single-cylinder engine and the automotive engine would continue to be important, but would receive less emphasis in an "ideal" program.

THE MAJOR ISSUES IN POWER MECHANICS

Teachers were asked their opinions regarding the major problems in power mechanics. When asked what should be included in an ideal program, the teachers overwhelmingly advocated a much broader program than they are now presenting. The major reasons why the programs are not what the teachers would like them to be are: there is a lack of appropriate software, there is a lack of appropriate hardware, there is a confusion over objectives, teacher-training programs need improvement, national professional organizations have not provided needed leadership, new types of facilities are needed for power mechanics instruction, there is a lack of information about course content, and there is a general resistance toward changing from a traditional automotive mechanics program.

WHAT SHOULD BE DONE?

The following are this writer's program suggestions for improvement of the power mechanics program.

1. Teacher-training programs should provide more coursework in power mechanics.
   The teachers voiced considerable dissatisfaction with their training. Over 75% of the teachers reported that they were unsatisfied with their training. Over 60% of the respondents thought their training could have been improved by more coursework in power mechanics.
2. Teacher-training programs should provide more coursework in science.
   Power mechanics cannot be studied or taught apart from the scientific principles involved in power, energy, force, etc. A substantial number of respondents reported that their teacher-training program could have been improved by additional coursework in science.
3. In-service programs on power mechanics need to be designed for teachers in the field.
   A very large number of power mechanics teachers had received no training at all in the field of power mechanics. Most of the teachers were originally trained as metals teachers. Large numbers at each level reported that they had never taken any formal coursework in power mechanics.
4. Instructional content should be aligned with definitions.
   Most of the power mechanics teachers define their area as a study of energy sources and machines that convert energy into useful work. The programs which are offered, however, bear little resemblance to the definition. If the course is centered on the automobile, it should be called automotives, not power mechanics. If the course is aimed only at the small single-cylinder engine, it should be called a small engines course, not power mechanics. Many of the teachers suggested that their courses could be given more descriptive titles.

5. Vocational courses need to be developed and articulated with the power mechanics program.
   A good many courses such as small engine repair, electric motor repair, etc., are natural feed-in courses from power mechanics courses. Vocational and industrial arts educators should begin to think about what should occur in both programs so that they might compliment each other.
6. Facilities should be designed for power mechanics instruction.
   One of the major problems identified by this investigation was that new types of facilities are needed for power mechanics. A facility which is designed for automotive mechanics may not be appropriate for power mechanics. What kind of facility is needed should be the subject of intensive study.
7. Packaged instructional units should be developed for power mechanics.
   When the respondents were asked to design an "ideal" power mechanics program, the instructional content in the "ideal" program was much broader than the one currently offered. The major reasons for this situation, according to the respondents, are a lack of appropriate hard and software. A system should be developed which includes performance objectives, instructional equipment, laboratory equipment, measuring devices, etc., for each of the power mechanics instructional topics.

Dr. Webster is Associate Professor of Industrial Arts at California State College, Long Beach.

Developing Instructional Systems for the Power Laboratory

James A. Sullivan

My remarks are intended for the innovative teacher, the student in his classes, and the educational manufacturer who supplies much of the equipment and learning material for our power laboratories. These three groups participate together to determine the quality of the learning experience in the formal educational setting of our schools.

RATIONALE

Modern power programs are designed from student-centered career objectives and focus on the over-all goal of vocational maturation within the confines of a career plan. This is in contrast to traditional program objectives which focus on academic attainment within the confines of the body of knowledge, commonly referred to as a discipline. In the first instance, the student samples tasks in the power laboratory which are vocationally relevant. That is, the student purposefully engages the learning environment to find out if the activity and subject matter can serve his career needs.

Developmental tasks cause the student to complete activities in different power-related areas and at different levels of difficulty. These serve to develop expectations about future work roles and requisite training requirements in power-related occupations. Horizontal sampling widens the student's perspective of power-related occupations, whereas vertical sampling raises in sophistication his level of performance (Figure 1-1). Notice that unless occupational skills are specified, the student's behavior is exploratory in nature, not vocational.

The areas that the student samples within the power laboratory develop or test preconceived interests. Such areas as heat engines, turbine converters, and fluid power transmission systems develop and enlarge the psychological field against which the student is evaluating future career possibilities and present decision alternatives (Figure 1-2).

Sample learning tasks develop some awareness of the behavior exhibited by people who work at respective occupations and of future training to develop this level of performance in school prior to occupational entry. For those who wish to pursue vocational training, many typical tasks from several primary interest areas should be completed. Learning tasks from several areas at appropriate levels also should be provided for those who

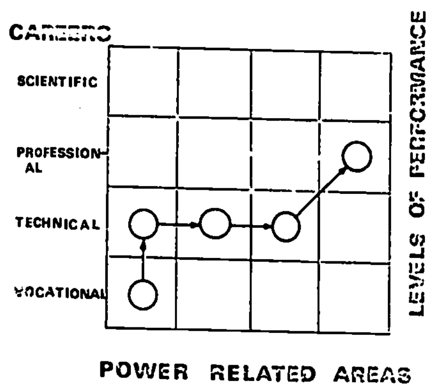
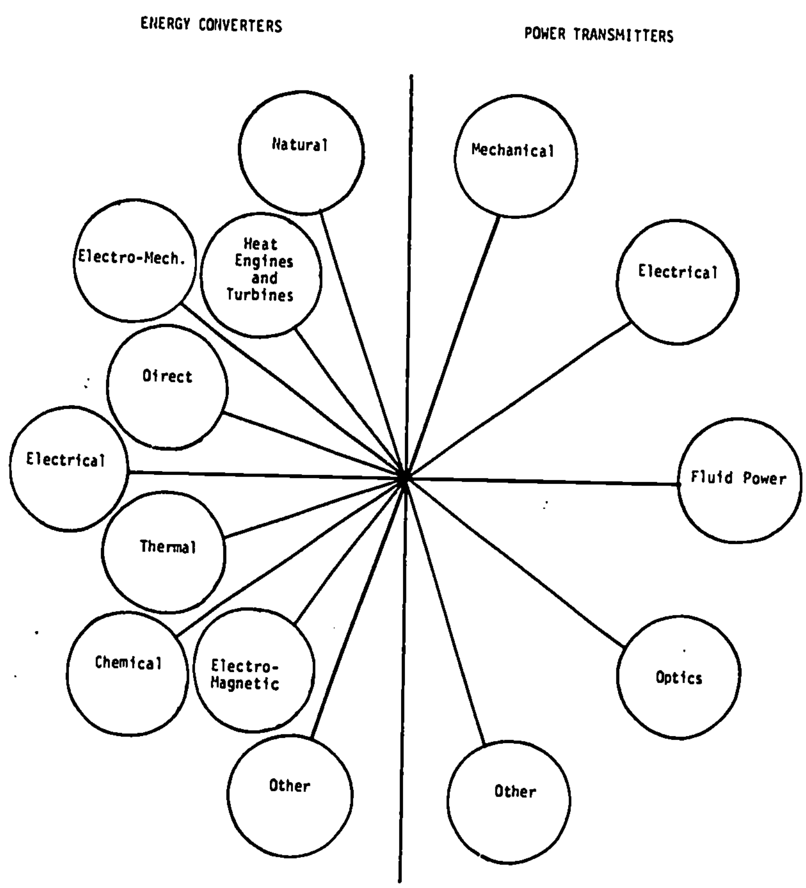


FIG. 1-1 THE ACTIVITY SAMPLING PROCESS



Energy Conversion and Power Transmission Classification

Figure 1-2.

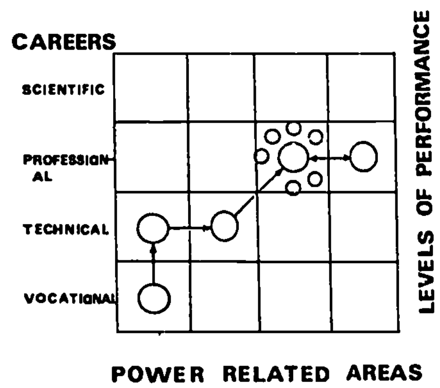


FIG.1-3 CLUSTER TENDENCY OF SAMPLED EXPERIENCES

wish to pursue technical, professional, and scientific careers. It is expected that the student's activities will tend to cluster in areas which are both challenging and commensurate with his capabilities and interests (Figure 1-3).

Developing instructional systems for the power laboratory requires the designer, whether he is a teacher or educational specialist from an outside enterprise, to consider the cumulative effects of instruction requisites and resources on the composition of the instructional process. Instruction requisites include the learner, the purpose of the activity, and the knowledge or subject matter available to the teacher. Instruction resources include the equipment available, the written instructions which structure the learning sequence, and the teacher-manager who sets the educational stage by determining the conditions of learning. The instruction process is composed of teacher management and student learning components as the student engages in prescribed activities.

The tangible substance of the learning system is generally considered to be the combination of equipment or hardware which demonstrates, simulates, or models some phenomena or process, coupled with a written and visual format or set of directions which structures and evaluates the performance of the student during the learning encounter. It is also generally accepted that neither the hardware equipment nor the software written and visual format alone can sustain the learning activity. Equipment hardware is supplied as part of the activity to increase the probability that the student will become involved in gathering first-hand experiences. Written software materials are supplied to set the structure of the experience so that this student will learn prescribed skills, information, and concepts in a predetermined sequence. It also enhances evaluation of student performance by specifying criteria the student must meet.

The written software format, sometimes referred to as a learning experience guide or learning activity package, also determines the level at which the student will be required to perform (Figures 1-1 and 1-2). This level of learning is usually independent of the hardware equipment, which may serve several levels of learning difficulty for a wide range of student ability. For example, the student who has an interest in automotive services occupations and commensurate vocational training may utilize a small gasoline engine in the power laboratory to develop manipulative skills used in the repair, installation, adjustment, or over-haul of an automobile engine. Alternately, the same equipment can be used to develop such concepts and principles as compression ratio, valve lift and flow area, displacement, torque, speed, power, and efficiency for the student who ultimately wishes to become an automotive technician or engineer. Note in the example that each student functions at a different level of learning, but that both may use the same apparatus in their study.

REQUISITES TO THE INSTRUCTIONAL PROCESS

Three requisites may be identified in designing instructional systems for the power laboratory: the learner, his preference for the activity, and the knowledge or subject matter.

Parameters associated with the learner include his age, maturation and educational-achievement level, interests, and educational needs. Educational needs refer to those developmental tasks in school which fit his career plan. The implication is that the student is made aware that his present actions and decisions affect, to a large extent, his future alternatives and subsequent goals. The student's age, maturation level, and educational achievement level have a strong influence upon the level of the experience which the student can complete. Identified natural interests give an indication of which areas and activities will spark the student to become involved in the learning activity. Career goals identify which activities have relevance to the student as developmental tasks in the sequence which will bring him closer to identified goals.

Learning activities are chosen to match the student's stated preference. The literature on career choice suggests that stated preferences are valid indicators of career aptitudes. The student may select activity by area and by level. Area refers to subdivisions of power as a subject matter area, such as heat engine converters and hydraulic transmission systems. Level of application refers to the hierarchy of performance which can be related to vocational, technical, professional, and scientific occupations. Performances such as motor or manipulative are representative of vocational occupations. Testing and analysis are representative of many technical occupations. Design and scientific investigations typify many professional engineering and scientific occupations. Students may select the area related to heat engines with the desire of becoming mechanics or automotive engineers. What the potential mechanic does as developmental tasks should be related to occupational activities such as repairing, adjusting, and tuning engines; whereas the potential engineer should be completing tasks which develop power-related concepts at the abstract level.

The subject matter must be related to the student's performance in the laboratory. This is to say that the student's performance in the laboratory is analyzed to determine the knowledge structure given him in the classroom setting. Isolated information that cannot be related to performance in the laboratory or that cannot be applied to a career goal has little promise of having value to the learner. This implies that information such as the history of power must be related to examples which have present meaning. Comparing engines of the past with those of the present, for example, has meaning only if comparisons can be made and verified in the laboratory between such parameters as efficiency, specific fuel, power, etc. Studying isolated events or persons from history without relating this to present applications has little meaning, except in the liberal arts or sapid sense. One lesson that career planning has taught us is that the pursuit of knowledge for its own sake cannot be condoned as worthwhile educational activity, except for the idle rich. It must be applicable.

RESOURCES FOR THE INSTRUCTIONAL PROCESS

Resources for the instructional process include the hardware demonstrator, the purpose of exercise, the software, and the teacher-manager who conducts the learning encounter by determining the conditions of learning.

The hardware or demonstrator is the actual equipment which presents the learner with the opportunity to become an operator. The student can engage the learning situation because there is something to do. He can collect, manipulate to develop psychomotor skills, verify the relationship of specific events, observe phenomena, and adjust conditions while monitoring the resultant reaction.

The software is the structuring device which communicates to the learner how he should proceed during the learning encounter. It structures the process, as well as the content of the experience activity or experiment, by determining the acceptable level of performance. Typically, it is designed around student goals, reading ability, state of educational development, and should center upon subjects which are of natural interest to the student. A standard format is used to present the student with consistent learning experiences. The format to be used is determined by the purpose of the activity. For example, if the activity is to develop a repair-related skill, the format takes on the appearance of a job sheet written much like those in repair and maintenance manuals. If the activity is to develop concepts or promote the solving of problems for a student who hopes to become an engineer or technician, the format is structured around a problem which requires performing procedures, gathering data, solving problems, and drawing conclusions.

Frequently, specific career objectives cannot be established for a given student. Here level of activity assumes added importance. If a student is better suited to mechanical or maintenance-level occupations, then installation, repair, and adjustment tasks should be engaged. If his capabilities conform to those of engineering or scientific-level performance, tasks which require analysis and synthesis skills should be engaged.

The teacher manages the learning encounter between the student and the subject by determining the conditions of learning for the student. He does this by providing equipment and learning sequences which bring about the desired performance on the part of the student. He is not the central focus of the class. The learning encounter which elicits student performance is the focus. If the desired student performance does not occur, the teacher changes the conditions of learning. The teacher's problem, then, is one of determining conditions that are appropriate for specific learners, setting the stage for learning by setting up these conditions, which consist of the equipment and learning guides, and adjusting the match between the student and the learning environment to bring about the desired student performance. Frequently, the teacher demonstrates what constitutes satisfactory performance and shows the student how to react with the learning environment. He also has the responsibility for keeping score, that is, determining how the student is doing during the learning encounter.

INSTRUCTIONAL PROCESS IN THE POWER LABORATORY

The sequence in which the learning is conducted or managed is made at the discretion of the teacher. Certain parameters which go into this sequence, however, must be present.

First, the teacher-manager must communicate available objectives to the student learner. The objectives tell the student the purpose of the activity, the behavior he will be expected to exhibit, the level of difficulty or type of learning involved, the conditions under which he will be expected to perform, and the method of evaluating his performance.

Second, the student selects which objectives he wishes to perform. He has examined available objectives and the types and purposes of learning activities and is aware of the purpose behind the learning experience. With this in mind, he chooses those which best suit his immediate purposes and long-range goals.

Third, the teacher-manager sets the stage for learning by prescribing the conditions of learning. He provides the equipment, the written and visual instructional material, a student learning station, and the time necessary to complete the exercise.

Fourth, the student-learner encounters the stimulus. He engages the activity purposefully as an operant. He determines his own learning exercise within the confines of the learning environment and its objectives. The student operates equipment provided by the teacher to develop skills or concepts defined by the objectives. He is active, not passive, in the learning activity.

Finally, the teacher-manager becomes the student's assistant by helping to correct minor deficiencies in the conditions of learning, clarifying for the student information or psychomotor manipulations of equipment which make the substance of the exercise more understandable. When the student has finished the learning experience, the teacher evaluates performance predetermined by the objective by comparing what the student was able to do with what was prescribed by the objectives of the activity.

SUMMARY

Those who would design learning systems for the power laboratory must consider the requisites of learning, the resources necessary to determine the conditions of learning, and the instructional process. Components of requisites to the instruction process include: the learner-related variables, the purpose of the learning exercise, and the hierarchy of knowledge which makes up the subject matter. Components of resources to the instructional process include the equipment which provides physical demonstration for the student, the written instructions which communicate procedures to the student, and the teacher-manager who conducts the learning encounter by determining the conditions of learning. Finally, the instruction process requires the teacher-manager to communicate available objectives to the student, the student to select those that are appropriate, the teacher-manager to set the conditions of learning, the student-learner to encounter the stimulus, and the teacher-manager to assist and evaluate the student by comparing observed with expected outcomes.

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Professional Publications

Potpourri (pō-pü-ˊrē): A Mixture

James Bignell

The state publications in industrial arts range from one-page newsletters to newspapers to several-page newspapers to bulletins and magazines. The editors' problems and solutions, if there are any, will be our concern.

CIRCULATION

In Florida, we send our Industrial Arts Association publication to every industrial arts teacher, principal, and superintendent where there is an industrial arts program. We also send it to other interested people, such as legislators and industrial arts colleges all over the country.

The newsletter put out by the state department of education (Dr. Steeb's office) is sent to every industrial arts teacher in the state. It is in mimeograph form and has no pictures. It usually has about 10 pages and comes out between issues of our association bulletin.

MAILING PROCEDURE

We in Florida have no special mailing procedure. We stamp all of our mailing. We have no special permit, as many do. I have all the addresses mimeographed on stickers and just have a set for each issue. This mailing list keeps changing as people write in and tell me to put them on my list; as a result, I often get their names on the list twice. I don't put names of teachers on the list; I just send it to the industrial arts teacher and the principal at a school. In large counties, I send them a package for their teachers and principals. They send them out in their inter-office mail, which requires no postage. About 2/3 of our publication goes out that way.

ADVERTISING

We get as many ads as we can—$175 for a full page ad for 4 issues of the quarterly bulletin. The newsletter has no advertising. Advertising pays about half the cost of the quarterly bulletin.

PRINTING SOURCES AND METHODS

The newsletter is mimeographed. The state association magazine is printed by offset on better paper by a commercial printer.

THE NEWSLETTER

The newsletter is usually smaller than a bulletin, and it is usually mimeographed or reproduced with an offset method of some type. Examples are State Department of Education Newsletter, County Newsletter, State Association Newsletter. Usually they have a pre-printed heading. Clubs have newsletters—our faculty Women's Club puts one out. They are less expensive to publish and serve the purpose of getting the news to the members. I send out an E.P.T. newsletter once a year to inform the members that their dues are due and at the same time tell them of news of the department and the university in general. Newsletters seldom have pictures, advertisements, or editorials; they are simply news. They will usually have a volume number and issue number under the heading. This is good for filing back issues. Many organizations bind their newsletters to keep a historical record of the organization. Newsletters usually have bold headlines with small articles. Good breaks in the print or spaces between articles make it easy to read, and bold headings help the reader to spot the part that he is interested in. Newsletters are usually typewritten, while bulletins and pamphlets are usually set in type. When a newsletter is typed up on two or three columns to the page, the usual practice is to have the spacing of words so arranged that all lines come out even at the end.

THE BULLETIN OR MAGAZINE

Many state industrial arts publications are of this type.

They ordinarily have a front page with a design or format. Some, like our national industrial arts magazine, have a picture along with their format. Color is a common thing on cover pages. If they are this type and not the conventional newsletter, the volume, issue number, date, etc., will be on the inside. We have a full page in our Florida Bulletin for this. Then we have a president's page. We have called it several things, depending on the president's wishes. Right now we call it the President's Letter. Each issue in most state publications of this type has some one thing featured, such as our national "MAN/SOCIETY/TECHNOLOGY" has issues on learning packages, disadvantaged children, etc., where the whole issue is devoted to the one thing. In state publications, you will see more news and local items of interest in their publications. Pictures and names help to make a publication more interesting and more attractive. Short, well-headed articles will be read, while long sophisticated articles will seldom be read. Don't try to impress your readers by using words they never heard. Look at the speeches President Roosevelt delivered; you will see large, complicated words crossed out and simple, small words written in. He was a wise man. PhD educators use this gimmick to make themselves seem educated and above the average public. That's one thing wrong with our national magazine, "MAN/SOCIETY/TECHNOLOGY." I go to sleep trying to read it. Maybe it's that I'm ordinary and not up on the high level of intellectuals.

SIZE OF PUBLICATIONS

As a rule, the size is 8-1/2 x 11 inches. Our national magazine is a good example. Ours is 6 x 9 inches. I guess it depends on the likes and dislikes of those doing it.

The size, shape, form, and general appearance should always be the same so that you build up a reputation, and your readers know it at a glance. For example, "Life" magazine wouldn't look right under a "Reader's Digest" cover.

It applies to one type of individual reader. I don't believe in trying to fool him by making it look like something it is not. If it is industrial arts—say industrial arts loud and clear, not "MAN/SOCIETY/TECHNOLOGY" and then muffle in small print the "Journal of Industrial Arts."

DATES OF PUBLICATION

Some have no set dates. They just send it out when they get around to it or whenever they feel a need for it. This is the case with newsletters more than with bulletins or magazines. Most of the magazines publish dates of publication and deadlines for copy. I find one of the most difficult things an editor has to do is to get copy on time to get the publication out on time. It takes many long-distance telephone calls, and then the issue comes out late if I can't get the printer to rush it through.

MEMBERSHIP

Most belong to the Educational Press Association of America. It costs $25 a year. Some have written to me and asked what good this does, how does it help, and many other questions which are hard to answer. I believe the one thing that memberships like this do is add prestige to your publication. In the discussion to follow this presentation, I'd like to hear from you folks about this membership situation.

THE EDITOR AND HIS EDITORIAL

An editor is a thinker, a writer, a reader, a reasoner, and one who puts it all together into words, an editorial. He lays awake nights thinking about many complicated and bewildering things and wondering what and why of it all. He is a thinker. After writing, re-writing; thinking, re-thinking; reading, re-reading, he comes up with words to put it all together so that the rest of the world will benefit from it. He is the thinker with solutions and non-solutions, whichever the case may be. He is an editor.

Whatever the subject, whether it be religion, education, politics, or just idle gossip, it is the problems of the world and the people in it. To be a good editor, he must know the whole thing. He must study his subjects from every angle. He must read everything written on the subject, listen to speeches, talk to people about it, see what the old philosophers had to say about it, and then put it all together into as few words as possible. Those few words must be so well chosen that it really and truly and completely conveys the ideas that took hours, days, months, and years to think out. It must be a masterpiece. It must be his best. Nothing less will do.

The editor must be a dedicated person, not one to think lightly on any subject. If he is good, thousands of people will read his writing and be influenced by it. If he is a true editor, he realizes this and considers it when he writes. The world may be changed by his editorial. The word editorial does not say it well. It is far, far more; it is reasoning, sound thinking, firm conclusions, and much more. It's the summation of all that has been said and thought; it is the meat of it all in a nutshell. That is an editorial, and what it will do is stupendous when you think of it. If you can control the thinking of people, you will control the world. This responsibility is on the editor. It is no little thing to be taken lightly. The editor is the one who puts ideas into words so the others will know. He is the one who creates, builds, and remodels ideas of present and past to form conclusions the world needs and is asking for. The world depends upon him. He is the guide to bring hazy, dim, and confused ideas to light and put them all in their right perspectives. He must think clearly and write wisely; he is dedicated to his cause because so much depends on it. His influence cannot and never will be measured in the good or harm he has done to the world he lives in. Think before you leap, think before you write. Think, think, think, then think some more. The results are immeasurable.

EDITING

I do as little editing as possible. However, I do cut out all profanity and slang, as I feel it cheapens my publication. As a rule, I print exactly what I get. With some long-winded articles, I cut out parts, and sometimes send them back to the writer to be shortened. An example of this is in our last April issue. The editorial is another thing. There you can say what you like. It's the editor's job to get as much over-all coverage as possible; do not let anyone dominate the whole show. It's the duty of the editor to write letters requesting county supervisors and others to report on industrial arts in their area to ensure full over-all coverage. If a little caution is not used, the publication will become narrow and reflect only the wishes of the editor.

PAY FOR EDITORS

School publications seldom get paid. They do it for the good of the cause. Sometimes it is rewarding and sometimes thankless. In Florida, the Florida Industrial Arts Association pays $100 to the editor to attend the national convention. That's all the pay I get, unless you consider the satisfaction of a job well done as pay. If I had more time, I'd do more, but, as is the case with most editors, they are all busy men. The old saying fits here: "If you want a fellow to do a job, ask a busy man, not an idle man."

TENURE OF THE EDITOR

Some organizations have a new editor every year. As a rule, this is not good, especially if your publication is more than a one-page newsletter. It takes a new person some time to get acquainted with it in order to do the job well. It's good to have a new editor work with the old editor for a time before taking over the job. One caution I have for a new editor is: Don't upset the applecart with the first several issues, because you may find out it was a pretty good applecart after all. Some of our best publications in this field keep the editors for years and years. I feel that when you have a good thing going you should keep it well oiled so it keeps on going. But if it's not good, get rid of it quick, before it gets to be a habit.

COSTS OF PUBLISHING

It costs us about $600 to $700 to publish each issue of about 2,000 to 2,500 copies. Advertising pays about half of this, and the association pays the rest. We send it out and have a commercial printer print it.

Mailing is about $50 per issue. We do not use the special rate permits that many do. It is expensive, but we of the executive board of the Florida Industrial Arts Association feel that it must be good or not at all. It carries our image to the 2,000 places it goes. Industrial arts in Florida has prospered, and I like to think that our publication had something to do with it. We send it to the legislators and everyone whom we feel has anything to do with industrial arts.

We charge $175 for a full-page ad in all four issues for the school year. My university pays for their ad on the back cover, the same as all the rest of the advertisers. I like to think that this is one reason why industrial arts has prospered and expanded at the University of Tampa while other college programs in the state have dried up and dropped out altogether.

So far, I have only been able to get a half-page ad for one issue from any other college or university. I always print university news whenever I get it, but Florida State in Tallahassee is about the only one that sends me anything and they send more than I can print.

HOW TO WIN FRIENDS AND INFLUENCE PEOPLE

As editor, it is easy to get everyone mad at you. You don't print their stuff, or you say the wrong thing. Everyone can pick on the editor, so it is good to find as many ways to fend off all this as much as possible and yet do the job. A few of the ways I do this is by answering every bit of news sent to me and telling them how glad I am to get it and that it is real important, but I just don't have room this time. However, one full-page advertiser took out a page, saying he didn't authorize it for this year and that the ad was old and out of date, etc. I wrote to him in a little other tone telling him that those who do business in Florida are those who advertise in the quarterly bulletin. Another thing I have been doing for years is to give the past president a bound copy of the quarterly bulletins that were printed while he was in office. They all have his picture and his president's page in every issue. I also try to print as many names as I can. People like to see their name in print. They also like to have their picture in print, so I print as many pictures as possible. However, I always see to it that everything has to do with industrial arts. Don't try to make it look like anything else. You can be a friend or an enemy by the way you do it.

Mr. Bignell is on the faculty of the University of Tampa, Tampa, Florida.

State Publications: Medium for Public Relations

Arvid Van Dyke

Most editors of state publications will, upon request, produce a number of reasons why their state organizations prepare news publications. Along with the desire to provide the membership a service, most editors consider that public relations is a primary function.

In what ways can this be achieved?

First, the publication provides what might be called "Internal Public Relations." Related to this term is another—communication. The newsletter lets the membership know what is happening. They read about the convention, the programs—even speeches, and they are better informed about themselves. Too often we assume that the left hand knows what the right hand is doing. People need to communicate; likewise, our organizations must communicate within themselves.

Internally, the publication provides continuity from year to year. The names of the Executive Board and Officers can appear in each issue, along with key dates and committee reports. The editor may wish to publish a membership form for the convenience of those who wish to join. Convention issues bring factual reports and records to the attention of all concerned and thereby encourage continued effort toward strong planning and programming.

Giving credit where credit is due may result when editors seek out unrecognized programs and report on these efforts. Often these programs are new and innovative—what better way to encourage change than by recognizing those who are changing? Teachers in many parts of the state will be much encouraged by reports which show other hard-working teachers pushing toward common professional goals.

Secondly, state publications serve as external public relations mediums. Each state has those individuals who should know more about our programs and services to their children. The printed page is one of the most sophisticated forms of communication. Everyone recognizes the significance of a news item which has appeared in a local paper. The state publications convey this same prestige.

Editors should consider the following groups of individuals as regular recipients of the state publication:

1. Principals and superintendents in schools which offer or do not offer industrial arts.
2. Personnel in the State Department of Education and Bureaus of Vocational Education.
3. Administrators in colleges and universities where industrial arts education is offered.
4. Legislators on state committees related to industrial arts education.
5. Commercial exhibitors who are serving the membership through their displays at annual conventions.
6. Groups serving the same individuals as your organization serves. On this list would be the American Industrial Arts Association, School Shop Magazine, Industrial Arts and Vocational Education, ERIC, and the U.S. Office of Education. Groups such as these refer often to our publications for information they can further relay through their publications.

As editors, the concern should be that more people are reading and talking about our programs in industrial arts. As they look through our publications, they must see the new, the successful, the continuing programs that industrial arts provides across the state.

Let the people know! When they know you, they support you. The printed page can tell our story.

Dr. Van Dyke is a member of the Industrial Education faculty at Western Kentucky University, Bowling Green, Kentucky.

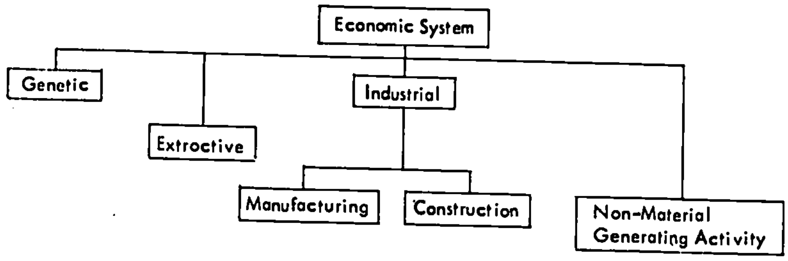
Study of Industry

MACO—The Manufacturing and Construction Technology Component

Richard A. Kruppa

The materials processing curriculum includes the studies of manufacturing and construction technology. The foundation of these studies is drawn strongly from the Rationale and Structure for Industrial Arts Subject Matter derived in 1966 by the Industrial Arts Curriculum Project at the Ohio State University. The rational asserts that industry resides in the economic institution.

The economic institution provides both material and non-material outputs (see Figure 1).



The Economy

Figure 1

Adapted from a rationale and structure for industrial arts subject matter.

The material portion of the economic institution is made up of three sub-groups. Genetic production, the first of these, includes those material outputs which are biological and are harvested in nature. Examples include fish, trees, and potatoes. The second sub-group, extractive production, is characterized by mining and includes one-time removal of solids, liquids, and gases from the earth and its atmosphere.

Industrial production, the third subgroup, differs from the others in that a substantial change in the form of the material is involved. In addition, the first two sub-groups make up the inputs for industrial production.

Industrial production is made up of the manufacturing and construction technologies.

Manufacturing production occurs in a factory and yields a product which will be consumed away from the point of manufacture. Clothing, furniture, and automobiles are manufactured products.

Construction production occurs not in a factory but on a site and is utilized at the site. Buildings, bridges, and dams are constructed works.

STRUCTURE OF THE CONTENT AND LEARNING ACTIVITIES

Undergraduate courses at Bowling Green are of two types. The core or lower division courses are conceptual in nature. All students in the department enroll in the core courses, in which the conceptual knowledge of construction and manufacturing is presented.

Concentration courses follow those of the core. Various groups of these courses may be selected by the student to benefit his professional development (see Figure 2).

Segments of the conceptual structure are studied in detail within the concentration courses. For example, methods of combining materials as classes are structured and studied in a core course. In a concentration course titled "welding," the student learns in detail and practices one family of combining processes. The emphasis of this report will be the description of core courses which examine materials, processes, and management.

Core		Concentration	
Freshman	Sophomore	Junior	Senior
Materials and Processes	Manufacturing 1 course required	Manufacturing 6 courses elective	Manufacturing 6 courses & independent study, elective
2 courses required	Construction 1 course required	Construction 3 courses elective	Construction 4 courses & independent study, elective

Manufacturing and Construction Curriculum Sequence

Figure 2

CORE COURSES

All students enroll in two materials processing courses in the freshman year. Neither of these is prerequisite for the other. The content of the course is similar, except that one course deals with the industrial processing of metallic materials while the other explores non-metallic industrial materials and their accompanying processes. The content structure of the courses is similar in certain aspects, as it relates to materials and processes. The students explore the nature of metallic and non-metallic materials with regard to their states or phases, atomic structure, bonding, properties, and means by which the materials are processed.

Laboratory activities include, in part, conducting tests of physical and chemical properties. For example, students conduct studies of mechanical and chemical moisture loss in ceramic bodies, moisture content of wood samples, burn and odor tests of plastics, view the grain structure of metal samples that have been conditioned at various temperatures, tensile strength test metal samples, and conduct a Rockwell hardness test.

The study of processes is facilitated by teaching the taxonomic divisions of separating, forming, and combining. These conceptual classes are studied to determine similarities in processes, regardless of material or machine. For example, students learn that principles of chip removal can be applied to many types of cutting devices and materials.

Casting, for example, is studied as being the same, conceptually, whether we are dealing with hot metals or cold liquid plastics. All common industrial processing methods are developed in a similar way. In this portion of the courses, students develop a limited degree of skill along with the knowledge of safe and proper operation of machines.

Students in both courses investigate various processes that are not represented in the laboratory and file reports. Such topics might include broaching, laser welding, or robot transfer and assembly. In the laboratory, students construct simple devices that demonstrate the processes and report to the class.

The two freshmen-level core courses establish a basis for two sophomore courses—manufacturing technology and construction technology. In the manufacturing technology course, the students work in groups and establish managed production systems. The production problems serve as vehicles to facilitate learning about industrial organization, plant engineering, industrial engineering, purchasing, production planning and control, manufacturing concepts of standard stock, component production and assembly, and quality control. The content structure for the experience is drawn from both the IACP Rationale and Structure referred to above and the Common Body of Knowledge for Management Consultants developed by the Association of Consulting Management Engineers. The student groups proceed through each of these phases of the managed production system, discovering and solving problems as they become manifest. The course concludes with a comprehensive written report and presentation to the entire class. Manufactured products have included such simple items as desk sets, key chains, plastic games, screw jacks, jack stands, and flashlights, to name a few.

The core course in construction technology, as that of manufacturing, utilizes the general knowledge of materials and processes developed at the freshman level. Concepts and skills unique to the construction industry are developed in this sophomore-level course.

The content of construction production is developed as students are provided with first-hand experiences clearing the site, earth working, building sub- and super-structures, and finishing the project.

Construction management knowledge is imparted as students, in groups, conduct feasibility studies for real or simulated construction projects. These teams establish project needs, study sites and plat maps, building codes, zoning legislation and other city/county/state/federal legal aspects, financing, profit estimates (for revenue-producing projects), design structures, and recommend to continue or cancel the project. Included in these studies is the production of a site and project model.

The feasibility studies have included actual projects, including a community recreation facility for Oakwood, Ohio, and a mobile home park. Simulated projects have included, among others, an automobile speed complex, county airport, university parking facility, and golf course.

CONCENTRATION COURSES

The core courses described above are taken by all the department's students and are intended to develop not only a fundamental knowledge of construction and manufacturing technology, but to provide a basis for career decision-making. As a result of the core courses in manufacturing, for example, a student may decide that he wishes to further his knowledge in the area, or to conclude it.

Concentration courses solve the function of developing in-depth knowledge of particular, significant areas of manufacturing and construction. Students enroll in them during their junior and senior years.

Current courses include: Manufacturing: Machine Tool Processing, Casting Processes, Plastics Technology, Sheet Metal Forming and Fabrication, Welding, Industrial Environmental Control, Strength of Materials, and Ceramic and Wood Processing; Construction: Light Building Construction I and II, Land Planning and Development, and Civil Construction. In addition, students have an opportunity to conduct advanced studies in industrial laboratories and independent studies.

Student activity in the concentration courses consists mainly of individual advanced problems and experiences culminating in the fabrication of equipment, manufacturing procedures, or special tooling, and includes problems conducted cooperatively among the areas of GRACO, MACO, and EPIC. Examples of such advanced work include a recently-completed extrusion blow molder for plastic bottle production. The machine was designed in one area, fabricated in another, powered and instrumented in a third. Other cooperative projects include a migrant worker house made of plastic, a magnification device for overhead projectors, an extrudate take-off system for plastic extrusion, and an automobile designed to exceed future Department of Transportation specifications for passenger cars.

WORKSHOPS AND SPECIAL OFFERINGS

During the summer session, various one-time workshops, institutes, and special offerings are made by the manufacturing and construction faculty. Some of these include: New Techniques in Welding, Destructive Testing, Non-Destructive Testing, IACP World of Manufacturing, IACP World of Construction, Plastics Processing Technology, The Automotive Industry—Manufacturing Organization and Procedures, Programming Numerically-Controlled Machine Tools, and Ferro Cement Applications. These special offerings are made for both graduates and undergraduates.

CONCLUSION

This report reflects curriculum development at a point in time. Our curriculum reflects the work of many faculty members and graduate assistants and is continually evolving. Under study is the reorganization of the core segment to include a high-level synthesis simulation and modification and expansion of the concentration offerings to include manufacturing systems analysis, production planning, tool design, metrology, materials handling, and other titles.

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Teaching the Functions of Industry in Industrial Arts

Charles E. Campbell

If one is to teach middle school students about the functions of industry, there are many issues which need to be examined. Most important of these is the student and where he is in his developmental processes. The community is very important when considering with which of the functions of industry the student will be able to identify. The facilities and the limitations that they impose are not too important to an instructor interested in using the enterprise approach to teaching students about American industry.

If one is to realistically consider teaching the functions of industry, he must look to see where an industrial problem originates. This is the conceptual idea and design of a product. This product must be one with which the students involved can identify. A successful technique to develop such a product is the brainstorming session to get ideas. From an original list of student ideas, all but a few are eliminated. Using color renderings, the students record ideas for products from these few remaining ideas. After several design and elimination sessions, a product design is accepted and becomes the product which the class will eventually produce.

A model is built, and if need be, redesigned. This will then become the revised model from which production drawings are made for future use.

The class decides on the materials to be used in the product. Specific specifications are decided upon and special materials are ordered. From this decision, the industrial engineering group is able to begin construction of jigs and fixtures.

Each eighth grade class is divided into four distinct divisions, with functions and subfunctions. The four divisions are: Research and Development, Production, Marketing, and Finance and Control.

In one semester of 90 hours, it is not only impractical but impossible to include all of the functions and/or subfunctions of the above four activity areas. It is advisable that one select only those functions and sub-functions that will provide a harmonious balance between the cognitive and psychomotor, as well as provide the basis for the affective domain to be shaped.

In the area of R & D, the entire class is involved in the basic research for a product idea. The class is then broken into small groups, with some students choosing the R & D area as a major area to explore. These students engage in the sub-functional areas of new product development and improvement, new process development and process improvement, engineering testing, factory follow-up, and aid in sales assistance, although the latter is usually grouped with the marketing area (refer to Figure 1).

RESEARCH-&-DEVELOPMENT

RESEARCH	DEVELOPMENT	PRODUCT ENGINEERING
BASIC RESEARCH	NEW PRODUCT DEVELOPMENT AND PRODUCT IMPROVEMENT	ENGINEERING TEST
APPLIED RESEARCH	NEW PROCESS DEVELOPMENT AND PROCESS IMPROVEMENT	FACTORY FOLLOW_UP
	PRODUCT REDEVELOPMENT FOR COST REDUCTION	

The activity area of production attracts and accommodates the largest numbers of students. Students in this area are subdivided into the six functions of the area, which are: Plant Engineering, Industrial Engineering, Purchasing, Production Planning and Control, Manufacturing, and Quality Control.

The area of plant engineering has students working in the area of facility design and specification and maintenance. Activities could include building conveyors, remodeling existing conveyors, or providing maintenance on existing equipment that has been purchased from commercial sources.

Industrial engineering provides students with many opportunities in the area of plant layout, material handling process studies, construction of equipment, and construction of jigs and fixtures. This group may find it necessary to combine with either the plant engineering department, the production planning and control department, or both during some parts of the experience.

The function of purchasing offers only limited experience for a few who are directly involved with the purchasing research and the actual buying and purchase records. Sometimes it is advisable that this responsibility be turned over to those few students working in the area of finance and control.

Production planning and control is usually a small department, but very active in the various sub-functions. These students are continually working on material procurement, operation scheduling, requisitioning of needed tools, jigs, and fixtures, as well as performance reporting on existing inter-company manufacturing accomplishments (refer to Figure 2).

Manufacturing is another area in which the entire class participates directly. Students are involved in the production of individual parts, the simple assembly of parts, and the final assembly and packaging of products for consumer use. Another area which is established in all companies is reclamation or salvage of products not passed by quality control. This usually takes place as an outgrowth of the actual production line activities.

Quality control is not as active during the tooling-up stages as it is during the actual production of the product. This is one area that does not reorganize during the actual production of the product. This is due to the extreme technical emphasis placed on the quality of the product.

Marketing is a large area, as it provides the student with many cognitive and psychomotor activities. The function of advertising and sales promotion offers students the opportunity to plan a real advertising campaign. This is student-designed from the preparation of the original copy, media selected, and the actual production of all materials used in the advertising of the product.

PRODUCTION

PLANT ENGINEERING
- UTILITIES DESIGN AND OPERATION
- FACILITIES DESIGN AND SPECIVICATION
- MAINTENANCE
- PLANT EQUIPMENT CONTROL

INDUSTRIAL ENGINEERING
- METHODS STUDY
- PLANT LAYOUT
- MATERIALS HANDLING STUDY
- TOOL, JIG, FIXTURE, AND PATTERN MANUFACTURE AND REPAIR

PURCHASING
- BUYING
- PURCHASE RECORDS AND FILES
- PURCHASE RESEARCH

PRODUCTION PLANNING AND CONTROL
- OPERATION SCHEDULING
- TOOL, JIG, FIXTURE AND GAGE PROCUREMENT
- PRODUCTION INSTRUCTION DISTRIBUTION

MANUFACTURING
- PART MANUFACTURE
- SUBASSEMBLY
- FINAL ASSEMBLY
- SERVICE AND REPAIR

QUALITY CONTROL
- CONTROL METHODS DEVELOPMENT
- INSPECTION AND TEST

The sub-function of sales planning is a class activity. The entire class is approached to examine the cost of materials, the pricing of the product, and the hidden costs involved. The acceptance in package design for the product is also a class activity. The design is derived from students working in both R&D and advertising.

Sales operations and physical distribution are usually worked together as one operation or process after the production run (refer to Figure 3).

MARKETING

MARKETING RESEARCH
- PRODUCT REQUIREMENTS DETERMINATION

ADVERTISING
- CAMPAIGN PLANNING
- COPY PREPARATION
- MEDIA SELECTION
- PRODUCTION

SALES PROMOTION
- PROGRAM DEVELOPMENT
- SALES AIDS

SALES PLANNING
- BUDGETING
- PACKAGING

SALES OPERATIONS
- ORDER SERVICE
- SELLING

PHYSICAL DISTRIBUTION
- WAREHOUSING
- SHIPPING

The last activity area, Finance and Control, is an important area, even though it is best kept small in number of participating students. The activities that it performs are the actual finding of methods to finance the company's operations. This is usually done through the sale of stock certificates. All orders, bills, and receipts are handled and filed through this area. This group also has the responsibility to return all stock dividends and the original price of the stock certificates to the investors (refer to Figure 4).

Figure 4

FINANCE-&-CONTROL

FINANCE	CONTROL
FINANCIAL PLANNING	PLANNING AND BUDGETING
CUSTODY OF FUNDS	SYSTEMS AND PROCEDURES

SUMMARY

The preceding will give one a brief overview of the activities that students are involved in and exposed to in the teaching of the functions of industry. This is a method of instruction, not just so much subject matter about industry. The list of activities is not complete, but they are compatible with the intellectual and physical maturity of the middle school student. They will challenge him and prepare him for many of his future life experiences. The product is not the physical product produced, but is in fact the student.

The cognitive and affective areas that develop within the student are indeed reflective of those that are not often developed until a much later period in life. They are also identifiable with general education. It is one method of instruction which puts the student at the center of the curriculum rather than the teacher (refer to Figure 5).

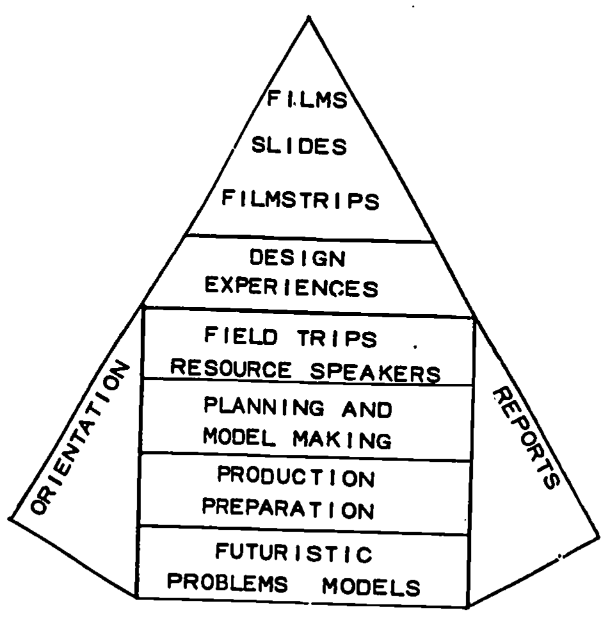

Figure 5

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Junior High Manufacturing with the Functions of Industry

Clarence L. Daughtry

Teaching with the functions of industry can best be described as teaching with a total industry concept. By total industry, we mean to include not only the actual production of the product as course content, but also the related functions of industry that aid in production. These related functions are as much a part of industry as is production, and any attempt to relate industry in an industrial arts class should include these supporting functions.

These related functions include Research and Development, Finance and Control, Secretarial and Legal, Organization, Personnel Administration, External Relations, and Marketing. Under these functions can be included all the activities normally found in a manufacturing industry. The original idea for these functions comes from the Common Body of Knowledge for Management Consultants.[1] From this source of information and others, graduate students at Georgia Southern College in Statesboro, Georgia, have compiled an industrial arts curriculum guide called Industrial Arts for the Middle Grades, MANUFACTURING.[2] This guide attempts to aid teachers in structuring their own courses to teach with the functions of industry. Such a course allows the students many role-playing experiences in which they have a chance to play the parts of people who perform the functions of industry. Behavioral objectives are established in each of the functional areas, and the students are assigned roles that provide for the attainment of these objectives.

Another goal of a course of this type is career development. While developing a knowledge and understanding of modern industry is a primary goal, the role-playing experience also aids in career development. The student can learn to identify with real life situations in a controlled laboratory environment. Many of the pressures of real life can be applied, and the situation can become very real for the students. When the total industry concept is used, the student can gain insights into many different functions of industry not normally covered in an introductory industrial arts class. Production is usually emphasized, and the other functions neglected or only lightly touched.

I teach seventh grade industrial arts to both boys and girls, and I have tried to adapt this method of teaching to my own situation. This is my first year of involvement in such a situation, and many of the problems are yet to be worked out.

The first step in my approach was to involve the students immediately in a controlled laboratory experience. The only prior information furnished to them was a safety briefing and the knowledge that they were going to produce a product that was useful to them. The product, a small puzzle, was produced on power equipment using jigs and fixtures and mass production techniques. The devices were designed to be as safe as possible and also to be nearly mistake-proof. Each student was assigned a job and given instructions as to how to perform his job. A puzzle for everyone was produced in only two class periods, and interest was at a peak. After production was over, we discussed the production of the product at length, and each of the supporting functions was brought in. The students were shown how each of the functions worked to support the actual production of the product.

After a period of study in which supporting material was introduced, the students were allowed to select a product from a group of suggestions. After the product selection, a company was formed to produce the product and vice-presidents were chosen to represent each of the function areas of industry. We then discussed the activities that each function would need to engage in to aid in the production and sale of the product. At this point, each vice-president and his assistants set out to perform the activities that were assigned to them.

The Research and Development group worked with ways to improve the product, methods of developing the product, tests of finishes and materials, research on similar products, and other things related to the research and development function. One specific exercise was that of preparing samples of various finishes.

Finance and Control worked on a method of obtaining financial support for the company. The method chosen was selling stock in the company. Stock certificates were designed and printed to be sold to the class. The persons working with control kept accurate records of all money and all transactions dealing with the money. This group also printed checks to pay the company bills and set up a bank within the classroom structure. Another activity in this area was the development of a company payroll and the printing of "money" to pay the employees with. Deductions were made in a student's pay for absences and failure to work up to expectations. Taxes, insurance, and other usual deductions were also taken out.

The Secretarial and Legal group dealt with the activities normally assigned to secretaries and lawyers. The secretaries wrote letters, prepared records of all meetings and other activities, kept files on employees and correspondence, and handled the ordering of supplies. The lawyers worked on obtaining a patent for the product, obtaining a company charter, and did research on how to get a business permit and on what taxes an industry has to pay.

In the area of Personnel Administration, job applications were prepared and filled out by all prospective employees. These prospects were then interviewed, tested, evaluated, hired, and assigned to jobs for the actual production of the product. A puzzle-type manual dexterity test was constructed, and each student was given a timed test on this. The more skilled persons were assigned the more complex jobs. Personnel also worked with Finance and other areas to develop and administer the pay scale and other employee benefits. During and after the actual production, evaluations were made of the effectiveness of the employees. At times, it was necessary to reassign the students to less difficult or more complex jobs.

The organization group helped all the areas of the company to work together. They developed an organizational chart for the industry and worked with management personnel to insure that all related activities were leading to the same goal, which was the production and sale of the product at a profit.

Production had perhaps the biggest job of all. They had to plan and execute the actual production of the product. They were, however, able to call upon other members of the company to act as employees during the production phase. Their basic jobs consisted of the drawing of the product, the making of jigs and fixtures, making preparations for and operating a quality control system, arranging the lab facility for production, and determining exactly what types of jobs would be available during production. From the list of jobs available, personnel wrote job descriptions and tried to fit each person in the job for which he or she was best suited.

Even before production began, the Marketing group made plans for the packaging, distribution, and sale of the product. A market research survey was taken to determine the demand for the product. Orders were taken and production quotas were set. This group also developed an advertising campaign consisting of posters, slogans, and tape-recorded advertisements meant for use on radio or television. A package was designed for the product and produced during production. Guarantees were also developed and included in the package. The first product had no need for a set of operation instructions, so they were left out.

The last function, External Relations, worked to improve the image of industrial arts in the school and the community. Free samples of the product were given to the principal, superintendent, and other community leaders. A small company newspaper was also published to let the other students in the school know what we were doing in industrial arts.

After the product was sold and all monies collected, all excess money above the cost of production was distributed among the stockholders as profit. Each student was able to make a 75-cent profit, as well as receiving one of the products. The first product produced was a pencil-letter holder combination designed to hold six pencils and a number of letters. They sold very well, and a group of about 100 students produced and sold over 200 of them at 75 cents each.

After the completion of this first product, other related information was studied to give the students a better over-all view of industry. Films and field trips were used in certain situations. The development of tool skills was given very little consideration in this course. It is felt that if a student develops an interest in the study of industry or a particular industry, he will then be able to concentrate on developing the skills necessary for this industry. This course is only an introduction.

After this period of study, the students were allowed to select, develop, produce, and market a product of their own choosing. With this and each product to follow, the teacher does less and less of the work in preparation for production, and the students do more and more.

The results of my work indicate to me that this is a very practical way to approach the teaching of an introductory industrial arts course. The method is not without faults, but neither is any other method. The students are well motivated and greatly gratified by the results of their efforts. The quality of the product produced is often considerably better than that of an individually-produced project. This method is also a little easier on the teacher, in that he works on only one product at a time.

The student gains many insights into and understandings of modern industry, a knowledge of the tools, materials, and processes of industry, and also is able to determine if working in industry might be the occupation for him.

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Mr. Daughtry is a member of the faculty at Jenkins County Elementary School, Millen, Georgia.

Simulated Building Carpentry Program, Spring Mountain Youth Camp

Robert R. Hildebrandt

Spring Mountain Youth Camp, one of Clark County's juvenile detention facilities, is located in the mountains about 50 miles from Las Vegas, Nevada. Many social scientists have termed it one of the most successful institutions of its kind, with a recidivism rate of 11.8%, compared to the national norm of 40% to 50%.

The Youth Camp atmosphere lends itself to creative and innovative curricular approaches by the school facility. Within this framework, the successful implementation of the Simulated Building Carpentry Program was possible. The present school year (1971-72) is the first detailed implementation of the building program developed at Texas A & M University.

In looking at the program briefly, one would find a student-determined rationale of logical progression. The drafting department developed the plans for the structure with consultation by the Clark County Building Inspection Department. Most of the students who participated in this program became involved in the actual plan development process.

With an idea of the structure to be built, the testing program was developed. Three tests were used on a pre-test — post-test evaluation. These included the Qualifying Test for Apprenticeship and Training Applicants, United Brotherhood of Carpenters and Joiners of America, the Kuder Preference Record, Form C. Vocational, and a reactionaire informally evaluated by five to ten individuals working in the construction industry.

Two one-hour seminars were held following the testing program. These helped describe some procedures for plan reading and layout techniques.

To give the student a chance to practice some fundamental building procedures, a scale model of frame construction was made by each student (scale 1 inch equals 1 foot).

Soft wood in scale sizes fastened by tack nails was used in the model frame. Expertise in the scale building was one of the qualifications for the simulated roles in the "Building Carpentry Program."

In preparation for the actual building program, a seminar concerning occupational information dealing with building trades was held. This was a supplement to an earlier minicourse concerning occupations and professions. Several consultants from local agencies volunteered to come to the camp to give their first-hand knowledge concerning labor, apprenticeship, building codes, contracts, bid and wage considerations. These individuals were enthusiastically accepted and almost universally quizzed.

Another short seminar was held to introduce the roles and provisions of the simulation game. Along with the introduction, applications were filled out for the jobs or roles contained in the game. The jobs included: General Contractor, Auditor, Sub-Contracting Company—Business Manager, Foreman, and Journeyman. The societal aspects of the game are also identified as: Taxes, Bankruptcy and Welfare (similar treatment), Judicial Action, Spending—Income—Investment and Expenses, and Evaluation (Status or Achievement).

As the game proceeds to a working society, the many necessary functions of its members is heavily dramatized. Employment is one of the first provisions necessary. Structured into employer-employee relationships, the actual work becomes a tool for a very effective learning experience in human dynamics. The technical information that is gained by job experience is also a valuable lesson.

Strikes, collective bargaining, and mediation are also important considerations in many avenues of employment. Teachings in all these areas are brought out by the drama and intrigue of the game, a game which simulates occupational life in a realistic environment.

Mr. Hildebrandt is industrial arts and occupational instructor, Spring Mountain Youth Camp, operated by the Clark County School District and the Clark County Juvenile Court Services.

An Assessment of the American Industry Project: Past, Present, and Future

Harry B. Olstad

In 1961, a group of staff members at Stout met to discuss the shortcomings of industrial arts—especially those programs being challenged by concerned educators who claimed that industrial arts was too narrow in scope and not meeting the needs of expanding secondary school curriculums.

Of the objectives commonly claimed by industrial arts, only a few were being fulfilled in an effective manner. The development of skills has traditionally been the strong domain of industrial arts, even though the philosophy of industrial arts had tended to down-play any emphasis on skills. The discovery and development of talents, interests, and aptitudes had traditionally been achieved through exposure to a few materials such as woods and metals or trades such as drafting and electricity. Problem solving was limited to projects and technical activities rather than to industry. Activities and instruction leading to an understanding of industry were practically non-existent or so limited in portraying the totality of industry as to be valueless. From this rather discouraging evaluation of traditional industrial arts programs came a determination to search for some means of strengthening industrial arts by redirecting its emphasis on skills to a new emphasis on understanding industry. Problem solving related to industry would serve well as an accompanying emphasis, especially considering its implications for conceptual learning and the conceptual orientation desirable for the study of industry.

Following this initial assessment of industrial arts, several funding grants were arranged in order to review the implications of the study and to determine the feasibility of continued research leading to a secondary school program providing for the study of industry. This led to a four-year grant from the USOE, during which the American Industry Project became a reality.

Under the American Industry Project, industry was defined, given a conceptual structure based on 13 broad understandings called concepts, and content was organized for each concept. The structuring of industry and organization of content was accomplished through cooperation from industrial and labor leaders, educational consultants, secondary school industrial arts teachers, and the staff at University of Wisconsin-Stout. This body of knowledge was considered appropriate for three secondary school courses called levels.

Instructor's Guides were developed for all three secondary school courses or levels. Instructional media for the first two levels was developed and coordinated with the Instructor's Guides. In addition, student booklets were written for the first level and also coordinated with the Level I Instructor's Guide.

In order to provide teachers with the competencies necessary to teach this new program, a four-year undergraduate program of studies leading to a Bachelor's degree in American Industry was established at Stout.

Over a period of three years, the first and second level instructional materials were field-tested in a number of secondary schools in Wisconsin, Minnesota, and Ohio.

In 1968, an NDEA institute was conducted for the training of teams of secondary school teachers. In 1969, an EPDA grant provided for a consortium with ten other universities for training teacher educators in the program of American Industry.

PRESENT

The conclusion of funding produced a period of reorganizing, regrouping, and reestablishing our goals within the limited resources of the university. During this time, it became necessary to evaluate our position in the university's total program. An additional concern included an evaluation of American Industry's impact on schools in the state of Wisconsin and the need for servicing those schools through a retraining program for industrial arts teachers. Consequently, by means of off-campus extension classes, more than 200 teachers in Wisconsin and Minnesota have been and are being retrained for teaching American Industry.

American Industry is presently an established program of studies for the baccalaureate degree at Stout and is an emphasis within the Master's Degree in industrial education.

The Level II Instructor's Guide has recently been revised and updated.

A limited program of publicity is being maintained through correspondence and through a comprehensive feature article in the May-June 1971 issue of Man/Society/Technology.

Consortium workshops in American Industry are being assisted with instructional materials and consultant services.

Two institutes have been conducted in Tokyo, Japan, by American Industry staff members for Department of Defense Schools in the Pacific area. Here American Industry is being introduced for its contribution to career development.

American Industry is presently exerting a strong influence on the reorganization of the School of Industry and Technology at Stout, leading to a broader conceptual organization of departments.

FUTURE

Today's future for American Industry is as challenging and exciting for me as it was at the time I first became associated with the project about seven years ago; however, that optimism is now established on a confidence in a rationale, structure, content, and instructional materials that are meaningful to the secondary school industrial education program.

One of the most interesting prospects in the future of American Industry results from some of our field-testing experiences, combined with a strong national trend in education.

During the time of the field-testing of the American Industry instructional materials, the statement was made by school counsellors and administrators that American Industry was providing a much broader and more meaningful exploratory opportunity than had ever been experienced in the past. Students were now given a chance to explore management, finance, production, procurement, and the other broad conceptual areas of American Industry rather than the previous limited exposure to a few occupations and materials made available through traditional industrial arts. This newly-realized facet of American Industry coordinated with the recent emphasis on career development provides an exciting dimension to the school curriculum. Here we have a course which develops an understanding of industry in a society that is highly industrialized. It is a course suitable for all students. In this course, students have an opportunity to encounter materials and processes of all types, to be a part of management, to use communication skills, to apply principles of finance, to experience relationships, to conduct research, and to be involved in all the conceptual areas considered basic to a study of industry. Out of this may come the discovery of interests and aptitudes related to all areas of the school curriculum. Through these experiences, the student is privileged to discover either academic or non-academic talents. Rather than a course which serves only a limited segment of the school population, we now have a course, American Industry, which serves the career development needs of the total school curriculum. If career development is considered as a continuum covering the world of work, career orientation, career exploration, and career determination, American Industry provides the broad meaningful experiences essential for career orientation and exploration for all students. American Industry's future is firmly tied to career development.

Our society's concern over the knowledge explosion is making it evident that education must be based on broad, useable understandings called concepts. Because the study of industry through the American Industry program is concept-oriented, the place of American Industry in the evolving curriculums will be more and more appropriate. Education is rapidly approaching the day when there will be little time for factual learning—when only the involvements and experiences leading to conceptualization will be permitted in the classroom. Therefore, I anticipate the time when American Industry will not only provide appropriate content for progressive industrial education programs, but will be an essential part of the school curriculum because of its conceptual orientation.

In 1968, the American Vocational Association published a revision of the booklet, A Guide to Improving Instruction in Industrial Arts. In this booklet we find the statement "Today's demands require an approach aimed at organizing basic concepts common to, and drawn from, all disciplines or areas of knowledge related to the total institution of industry." In other words, content for industrial arts education should be derived from the social institution of industry. This statement provides a broad interpretation of industry as it is to be presented in the secondary schools. Considering the restricted interpretation given industry in the past, this statement might even be considered quite extreme. As education recognizes the real meaning of "deriving content from the social institution of industry," industrial education, especially industrial arts, will take on a totally new image. American Industry, with its conceptual approach to understanding industry, will play an extremely important part in industrial education's new role. In fact, as one looks at the trend being set by other innovative programs, one can only conclude that developing an understanding of industry will be the big emphasis of the near future. American Industry is ready to play a dominant role in that future.

In Arizona, we are seeing a unique use of the American Industry program in representing one of this country's most cherished institutions—the free enterprise system. The conceptual structure of the knowledges necessary to understand American Industry places the 13 basic concepts of industry in an environment of government, public interest, resources, private property, and competition. These environmental concepts, especially competition, provide a unique opportunity to study and experience the free enterprise system in relation to industry.

One of the unusual aspects of American Industry is its capacity to be interdisciplinary. Just as the free enterprise system is an integral part of the study of industry, so are most disciplines appropriately considered within the study of industry. Industry is often interpreted in literature; history tells us how industry has evolved; the labor movement moves hand in hand with industry; sciences provide many of the knowledges used in industry; arts, business education, communication skills, and mathematics are functional parts of industry; physical education and music at the professional level fall within the definition of industry.

Many practical reasons exist for American Industry to become the hub or focus of functional school curriculums. Such a use of American Industry has been considered by a number of educators and has already been implemented in the workshop for the Department of Defense schools of the Pacific. The interplay between the study of industry and the other disciplines of the school is one of the most promising and exciting aspects of American Industry. Consider the educational integration which occurs as other teachers become consultants to American Industry or when problems, activities, and situations which are utilized in American Industry are focused upon and expanded in other classes.

I feel that through American Industry, industrial education must take its place at the center of the school curriculum, thereby providing for meaningful integration of the curriculum, providing a conceptual framework for broad learning experiences, and providing a comprehensive approach to career development. This potential for American Industry in the future is neither impractical nor unrealistic.

While the preceding expectations for the future of American Industry are of a somewhat philosophical nature, some changes which are occurring will be specific and measurable. In the fall of 1971, the School of Applied Science and Technology at University of Wisconsin-Stout became the School of Industry and Technology. The change in name took place because of the new emphasis being placed on the study of industry. In reflecting this new emphasis on industry, departments of the school are now designated as Graphic Communications, Materials and Processes, Energy and Transportation, and Industrial Management. This departmental reorganization better represents the conceptual structure of the study of industry and provides a basis for a revision of the program of studies in industrial education.

At this time, most of the groundwork has been established for a program of studies in industrial education which will be based on fundamental courses related to industry. Regardless of whether a student chooses to major in American Industry, industrial arts education, vocational or technical education, he will have the background necessary to teach an introductory secondary school course in American Industry. In other words, every industrial education graduate of Stout will have a background in American Industry. In numbers, this will amount to about 300 industrial education graduates each year. In another four years, industrial education graduates of Stout will be either specialists in American Industry, generalists with a background in American Industry and an emphasis in some area such as Energy and Transportation, Graphic Communications, or Materials and Processes, or a specialist in some vocational or technical area based on a background of American Industry.

Finally, as to my expectations for my own personal future in American Industry, I look forward to submerging my American Industry responsibilities in the total study of industrial education, continuing to work with those who make the study of industry an integral part of industrial education, meeting the industrial arts objective of developing an understanding of industry and problem solving related to industry, while other areas of industrial education work to meet the objectives of developing skills and competencies. At that time, those of us who have worked in the development of American Industry will be confident that American Industry has provided the new direction necessary for industrial education to effectively meet all of its unique objectives.

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Student Incentive from a Business that Starts in an Industrial Arts Lab

Steve A. Walker

Individuals having a responsibility to teach, direct, or supervise the student may find it worthwhile to devote a measure of thought to the key words within the title of this presentation.

<u>Student:</u> a person who studies or investigates; a person who is enrolled in school.

The first definition of student, "one who studies or investigates," certainly describes a more meaningful involvement than the latter, "person who is enrolled in school." It is the educator's primary duty to create an atmosphere in the laboratory or classroom that will promote study and investigation by the student. This involvement in study and investigation will aid the student's development of mind, body, and spirit, and will result in a self and group discipline required in any business, large or small.

Incentive: Influence to action, encouraging, motivating, something that influences to action.

The need for student incentive is most evident and certainly widely recognized. As educators, we must provide the influence to encourage, motivate, and stimulate the student to action; therefore, instilling incentive within the student is a basis for continuing accomplishment.

Business: One's work, occupation, profession.

In this discussion, "one's work" shall refer to the selling of a commodity and/or service with a profit motive. Generally, the student will engage in the business of earning a living by selling his ability to provide the service and/or commodity for a profit; or at least to "break even" and provide the necessities for himself and his family. To do so is an honorable endeavor, and a portion of our teaching should be directed toward establishing this fact in the mind of the student.

Laboratory: a room or place for experimentation or research.

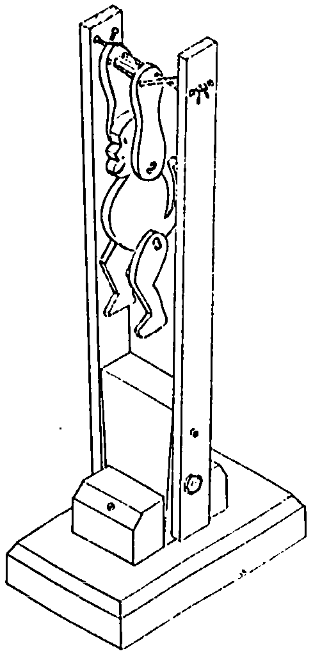
The industrial arts lab must fully fit the definition, "a place for experimentation and research." Here the student can be influenced to action in his work to the degree that the ultimate end shall be a desire, or incentive, to go about his business with confidence. The lab is probably the key element in our title, for it is here that the separate ingredients of a business are brought together for the first time. Here the student begins to master machines, tools, numbers, measurements, materials, and begins to see the results of his efforts. He begins to learn something about success and failure, trying again, improving, gaining "know how," and actually seeing what he has created. The lab must continually be improving to attain our title objective.

The student, by nature and habit, studies and investigates all phases of the environment and life that surrounds him. Unfortunately, that environment may have already gone to some length to develop the "enrolled-at-school" type student. This is not an exclusive reference to the so-called "other side of the track boy." The condition is widespread on both sides of the track. The student can so often be influenced by attitudes such as, "Who wants to really work; who wants to cut boards, bend metal, paint with a brush, or lay stone or brick?" From what he has been told, he has deduced there is no future in those types of work. What he needs to do is be an executive, go to the moon, fly a plane, be an engineer, or a pro athlete. That's where the money is; that's where the glory is. Miss these things, and you have "no business"—you have "missed the boat." This is not true. There is nothing wrong with these specialized businesses or professions, but they're not for everybody. It is at this point we must influence the action, to motivate, to stimulate, to create the incentive for our investigating individual. He must be guided to create with his own hands, to think for himself, to improve upon his own ideas, and to properly manage himself in relation to other humans and machines in an organized environment. As a result, he may be one who is in demand in our society for what he can do in a business-like manner.

An incentive must be sparked at the start of a business. Without it, there is no business. With the proper incentive, a student can begin the business of dealing in a commodity or service with a profit motive and can begin improving himself and accomplishing his goals in life. Can this concept produce results? Proof that it will work is revealed in the example of the "monkey business."

The monkey was introduced as a required project for seventh graders. This fellow and many like him were the results of a business that started in the Allan Junior High School Industrial Arts Lab, Austin, Texas. The business was a good one based on incentive and action. Profit was attained, and the partners in the business realized gain they had never expected.

For several years, the Allan Junior High Students have had an Industrial Arts Student Association. The members pay dues, have officers, and select projects for the club. Each member has a vital part in the action of the club. In addition to being a required project for seventh graders, it was realized that the monkey could make money for the club. The building and selling of a number like him could put profit into the club account and could provide for a trip for the club members to Six Flags, a place that was beyond their reach as individuals. It has to be an individual effort combined into a club effort. How similar to a business this was; an individual effort combined into a group effort that provided a profit and livelihood for those involved. During the Monkey Business, the students became familiar with piece work, planning, and supervision, with each man doing his share. Each realized he was a vital part of the manufacturing and marketing of the product. The effort stimulated thought for new projects and products, and also promoted a long-lasting interest in production for profit. These ideas and exposures to production, marketing, doing good work, and the value of planning will stay with the students in later life.



Did only the student benefit? Certainly not. Before the project was completed, little brothers, sisters, and parents stopped at the lab to see the products. The long-range benefits to the student, the school, the family, the community, and the instructor was valuable. The Monkey Business Project established one thing for certain. We need more Monkey Business.

Over the last four years, there was also a fiberglass canoe manufacturing endeavor. This began when a group of boys consisting of junior high industrial arts students and senior high students (formerly from Allan Junior High) asked assistance in making wooden canoes. They formed a club which eventually became an Explorer Post. After much discussion, it was finally decided to build a fiberglass reinforced plastic canoe due to the mass production capabilities. Upon receiving donated materials from a large local boat manufacturer, a "plug" the desired shape of the future canoe was made. The plug was constructed of wooden strips nailed to frames; the whole was covered with fiberglass and sanded very smoothly. A two-part mold, 15 feet 4 inches in length, was made from this plug. The students learned from trips through the boat manufacturing plant that the plug must be free of scratches. Every scratch on the plug would show on the mold, and every part made from the mold would have the same scratch in it.

The first three canoes were "layed up" with layers of scrap glass. The gunwales and seats were assembled from white oak and plastic webbing. Stainless steel hardware was used. Two of these canoes were sold to obtain finances for new materials for more canoes. Using these materials, two canoes were manufactured during the 1968 Boy Scout Scout-O-Rama held in Austin, Texas. Due to the response at the Scout-O-Rama, the students talked of forming a company, and finally a corporation, requiring three adults under Texas law, was formed. The students selected three teachers who would assist them.

At this point, the joint efforts of a group of students became a business. Up to this time, all work was done in the Junior High lab before and after school and on weekends. After the corporation was formed, it was decided that more room was needed and that a business should not operate with school equipment and space. After borrowing a thousand dollars and searching for a location, the corporation went into business in a 3000-square-foot rented building. Within a year of manufacturing during the summer and on weekends, approximately 25 canoes with wooden fixtures were produced. It was then decided to use aluminum gunwales, "pop" rivets, and fiberglass seats. A not quite as "classy" canoe was produced, but it required less maintenance and less assembly time.

In 1969, the corporation entered the Austin Boat Show with a three-canoe booth display. During the three-day exhibition, five canoes were sold. It was at this point that the students really had to meet the public and "sell" their product. From comments from the public, they learned the value of their work and took pride and great satisfaction that they participated in something unique.

Since any work with catalyzed plastics is done with a limited time factor, the members soon learned that there must be a cooperative effort among the whole group or there would be a loss in material and wasted time. Starting small, with a one-quart spray gun and a homemade compressor, and growing to an air-less system spraying at approximately 1200 pounds/square inch gun pressure, the students eventually developed a \$5000.00 inventory. The members became familiar with a wide range of hand tools and power equipment used in fiberglass. They also did repair work on fiberglass cars, fertilizer tanks, marine equipment, and stock tanks.

Of the students who stayed with the corporation and have graduated from high school, several have jobs in the fiberglass industry. One is a 20-year-old foreman with a company which manufactures waste and water purification systems. He is responsible for the design work and manufacturing of several $800,000 units which carry a five-year 100% replacement guarantee. At the same time, he is setting up his own company to repair and build unusual car bodies.

Of the teachers assisting the corporation, two are still in teaching and one has left the profession to become the general manager for Laredo Cab and Camper of Laredo, Texas. This company manufactures fiberglass-reinforced plastic pick-up cabs and campers.

In January 1972, the corporation was sold, all outstanding bills were paid, a small profit was gained, and each member received useful knowledge of our technical work world.

In conclusion, these students have gone from boys to young men who are proud of their work and accomplishments. They have developed an attitude toward work which enables them to succeed.

Mr. Walker is Director of the Career Awareness Program K-6 for the Austin Independent School District, Austin, Texas.

Teaching Manufacturing Using a Multi-Media Approach

Richard Henak and Thomas Wright

In discussing the topic, "Teaching Manufacturing Using a Multi-Media Approach," a two-prong approach is necessary. The first prong is an outline of the conceptual structure of manufacturing. The second prong is the integration of the concepts through the use of several instructional media. This discussion will be limited to these two phases as they are used in several classes at Ball State University.

STRUCTURE OF MANUFACTURING

Manufacturing has two main elements: the process used to shape and form materials into useable products and the management practices used to integrate the processes so that products can be produced in quantity. The courses at Ball State are specifically designed to place major emphasis on the management element of manufacturing.

One approach to the study of management is through the study of the evolution of a product from an idea through profit. Five major areas of management activity are involved in the idea-to-profit path. These are Research and Development, Production, Marketing, Industrial Relations, and Finance. Figure 1 shows the interrelationships among these five areas.

These five areas, with appropriate sub-concepts as shown in the content column of Figure 2, comprise the structure of management.

INSTRUCTIONAL MEDIA

In the title of this presentation—Teaching Manufacturing Using a Multi-Media Approach—the term multi-media needs clarification. Commonly, multi-media refers to simultaneous or sequential use of a number of visual and or audio materials. The program may be manually or automatically controlled by cuing devices. Multi-media in this presentation refers to the use of a large variety of media that is sequenced, but not sequenced into a close-knit program. Extensive use of elaborate simultaneous programs give way to multi (variety of) media specifically selected or developed to convey selected knowledge or skills in a variety of ways.

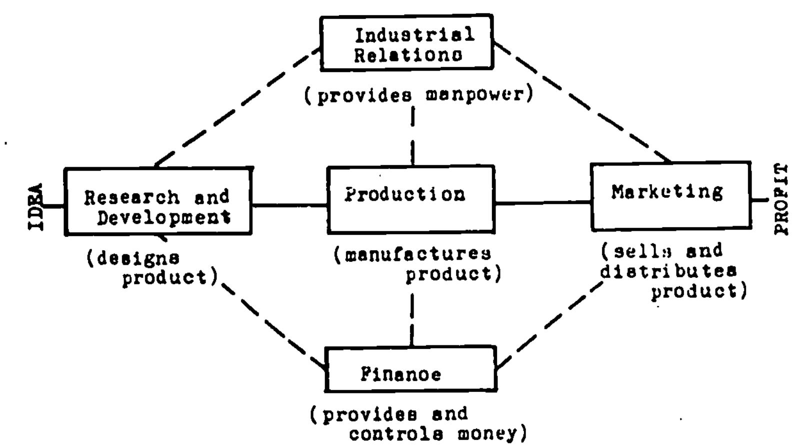


Figure 1: Idea-to-Profit Path

Figure 2

CONTENT	INTRODUCTION	PRESENTATION	SUMMARY (Immediate & Review)
I. Introduction to Manufacturing	"American Business system: How It Evolved" (16-mm film)	Conceptual Model	
A. Overview			
B. Concepts			Football Review Game
1. Institutions of Society			Felt Board — What Is Industry? Slide Series
2. Economic Institutions			Felt Board — What Is Industry? Slide Series
3. Industry	Conceptual Model		Felt Board — What Is Industry? Slide Series
4. Manufacturing	Bulletin Board	Transparencies	"American Business System" Slides
5. Management	Bulletin Board	Transparencies	"American Business System" Slides
6. Levels of Management	Bulletin Board	Transparencies	Industrial Management Slide Series
7. Activity Areas of Management		Transparencies	Industrial Management Slide Series
II. Research and Development	"Factory: How a Product Is Made" (16-mm film)	Transparencies—Slides	Felt Board — "Idea - to - Profit" Picture Set
A. Research	"Factory: How a Product Is Made" (16-mm film)	Transparencies—Slides	Felt Board
B. Development	"Factory: How a Product Is Made" (16-mm film)	Transparencies—Slides	"Research and Development" Slides
C. Product Engineering	Bulletin Board	Transparencies—Slides	"Research and Development" Slides
III. Production	Introductory Production Line		Felt Board
A. Manufacturing (Industrial) Engineering	Introductory Production Line		Felt Board

CONTENT	INTRODUCTION	PRESENTATION	SUMMARY (Immediate & Review)
B. Production Planning and Control C. Manufacturing D. Quality Control	Bulletin Board	Transparencies—Slides	"Production" Slide Series
IV. Marketing			
A. Market Research B. Advertising C. Sales D. Distribution	Bulletin Board	Transparencies—Slides	Felt Board "Marketing" Slide Series
V. Finance and Control A. Finance B. Control C. Purchasing	Bulletin Board	Transparencies—Slides	Felt Board "Finance" Slide Series "Idea - to - Profit" Picture Set Football Review Game
VI. Industrial Relations A. Employee Relations 1. Wage and Salary Administration 2. Employment 3. Training 4. Safety 5. Employee Services 6. Communication B. Public Relations C. Labor Relations	Bulletin Board	Transparencies—Slides	Felt Board "Industrial Relations" Slide Series
VII. Unions	Bulletin Board	"Union Organizing" Slide Series Transparencies	

Figure 3

CONTENT	APPLICATION	EVALUATION
I.		Objective Examinations
A.		
B.		
1.		
2.		
3.		
4.	Management Application and Employment	
5.		
6.	Departmental Organization Chart	
7.	Management Position Program (SIP "Writing a Program"	Evaluate Program
II.		Evaluate Product Ideas
A.	Planning Board #1 — Product Design for Later Production	
B.	Planning Board #2 (SIP "Preparing for the Second Planning Board) — Product Design for Later Production	
C.		Evaluate Materials and Pres- entation
	STUDENT ENTERPRISE	
III.	Plan and Organize Production System:	
A.	1. Design and construct tooling 2. Design plant layout 3. Design material handling system.	
B.	4. Design manufacturing methods 5. Routing and scheduling 6. Develop quality control system	
C.	7. Design and build inspection devices 8. Supervise manufacture of the product 9. Departmental budgeting	
D.	10. Etc.	
IV.	Develop and Implement Marketing Program:	
A.	1. Conduct a market survey 2. Develop a company and product promotion program	Department Manager's Merit Rating
B.	3. Develop sales program 4. Select and train salesmen 5. Sell and distribute products	
C.	6. Maintain sales records 7. Develop department budgets	Teacher-Student Conference
D.	8. Etc.	
V.	Develop and Implement a Finance Program:	
A.	1. Incorporate enterprise 2. Prepare prospectus 3. Raise capital	Management Log
B.	4. Develop corporate budget 5. Develop and maintain financial records 6. Develop purchasing system	
C.	7. Secure necessary materials 8. Etc.	

CONTENT	APPLICATION	EVALUATION	
VI.	Develop and Implement an Industrial Relations Program		
A.		Notebook of Materials Developed by Student Managers	Objective Examinations
1.	1. Study and price jobs		
2.	2. Recruit and employ workers		
3.	3. Develop safety program		
4.	4. Develop indoctrination and training program		
5.	5. Resist union organizing activities		
6.	6. Negotiate union contract		
B.	7. Develop communication system	President's Evaluation of Student Managers	
C.	8. Etc.		
VII.	Organize a Non-Union Plant and Bargain for Workers:		
	1. Organize workers		
	2. Elect union officers	Teacher Observation	
	3. Negotiate contract		
	4. Handle grievances		
	5. Etc.		

In 1967, when the course was first taught in the current format, the content was in the process of being identified and structured. At this time, the 16-mm projector, filmstrip projector, and tape recorder were used to present some commercially-prepared media. The overhead projector was used to present locally-developed and copied transparencies. Today, with the exception of two 16-mm films, the instructional media are all produced locally and include bulletin boards, felt boards, slide series, transparencies, posters, games, line production activities, picture sets, SIP's, and PIP's.

The reader may note in Figures 2 and 3 that the concepts comprising the course occupy the vertical axis of the matrix and that the instructional purposes occupy the horizontal axis.

All concepts receive an introduction, a presentation, a summary, and an evaluation. Application activities are assigned for those concepts that are directly related to the functions involved in the evolution of an idea into profit.

Dr. Henak is an Assistant Professor at Ball State University in Muncie, Indiana. Dr. Wright is an Associate Professor at Ball State University in Muncie, Indiana.

Automation: Its Study and Inclusion in the School Curriculum

Ronald Todd, Ray Shackleford, Chuck Campbell, and George Samson

The major underlying assumptions of this topic are that automation can be taught in labs and shops both at the conceptual and involvement levels, including the study of automation in the curriculum need not be expensive, the study of automation can integrate and extend what students learn in other areas, and automation can provide in-depth experience for students who have been involved in manufacturing as an area of study. All of the above statements will hopefully become clearer through the specific comments and examples that follow.

In order to provide specific hands-on experiences for students in the study of automation, we must first understand the make-up or nature of automation. This means that we need adequate conceptual "handles" for dealing with this major idea. Once these "handles" have been defined, we should be better able to provide specific learning experiences for students that are related to the concept. The conceptual "handles" that are described in this paper indicate the boundaries within which we are operating, the elements comprising automation, and the relationship between those elements.

At the time that the initial work of James Durkin, Doug Stallsmith, and Ronald Todd on the study of automation started some ten years ago, only a few clearly developed treatments of the subject were available. The ideas presented in the articles of Automation magazine represented one of the best sources for this group. One conceptual overview of automation presented in that magazine has proved useful and productive for nearly a decade. That overview is shown in Figure 1.

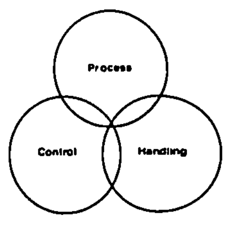


Figure 1. The Elements of Automation

The diagram in Figure 1 presents three distinct, yet related, elements of the concept of automation. Any instance of automation would include each of the three elements. The process element represents the operation(s) used to change materials, information, or energy. Handling includes those operations for moving the materials, information, or energy to, through, and from the process. The control element represents those operations that regulate the speed, intensity, and duration of the process and the movement of whatever is being handled.

All activities such as changing or converting materials will include all three of the elements shown in the diagram above. Generating a hole by drilling a piece of materials will include not only the process of drilling but also the related operation of feedings. Handling would include placing of the material in position and ejecting it after the process. Control would include the holding or clamping of the materials as well as the starting, maintaining, and stopping of the feeding operation.

In this example of drilling a hole, however, the three elements of process, handling, and control have remained relatively distinct and separate. If any degree of automation is to be achieved, it will be necessary to bring the three elements into a relationship as depicted in Figure 2. This closer relationship is shown graphically by a greater overlapping of the three circles. This signifies that the process and handling elements are now controlled and integrated in such a manner as to remove man as a needed component from the actual operation. Man's role of positioning the material, deciding when to start feeding, and when to end it has been transferred to certain parts and sub-systems of the machine.

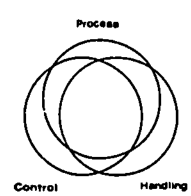


Figure 2. A Higher Level of Automotion

Instead of relying on a person to do the feeding, it is necessary to have the capability of feeding the drill by some other form of energy. This may be done through devices that are pneumatic, mechanical, or electrical. The capability of automatic feed can be attained by adding one or more parts to a standard drill press. An example of such a device that is used in industry and is available through industrial distribution is shown in Figure 3. This device is comprised of an air cylinder or motor, a rack and pinion gear, and a valve that can be switched to control when the air flows in one end of the air cylinder or the other.

It is also possible to secure drill units with an automatic feeding function that is already built in. Such drill units can be used along with other components to build up simple automated devices. This approach may be more fruitful for some individuals, since it allows for a great deal of inventiveness as well as for using devices that can be secured from government surplus. The sophistication of the parts used and the machines developed will be determined partly by the monies available to the teacher and partly by the age and development of the students involved in the study of automation. An example of fabricating and erecting an automatic drilling machine from component parts is shown in the photograph in Figure 4.

The machine in Figure 4 was developed to simultaneously drill two holes in a wooden block that was to serve as an axle for a toy truck. Most of the parts of the machine were acquired inexpensively through surplus. The modular support components used in the machine were secured from the Wesflex Manufacturing Company, Norwalk, Connecticut.

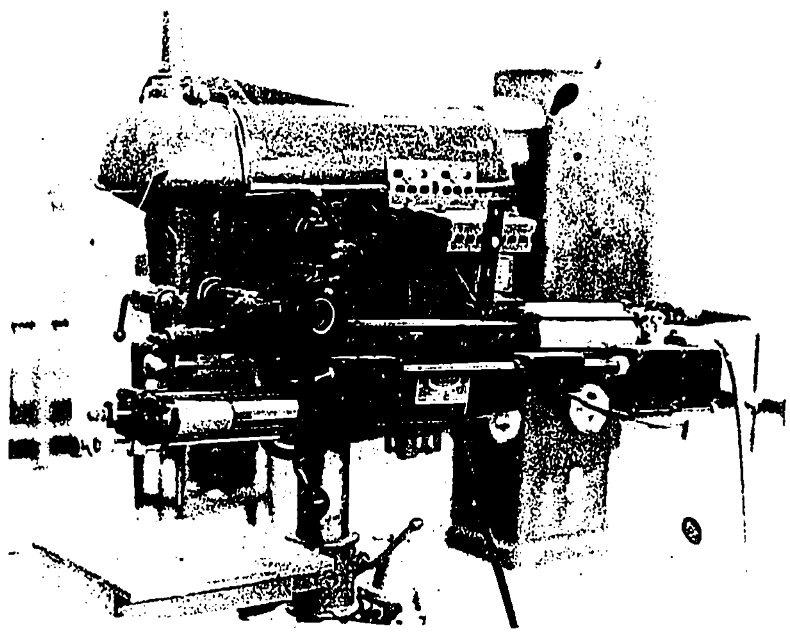


Figure 3. Automatic Feeding Device

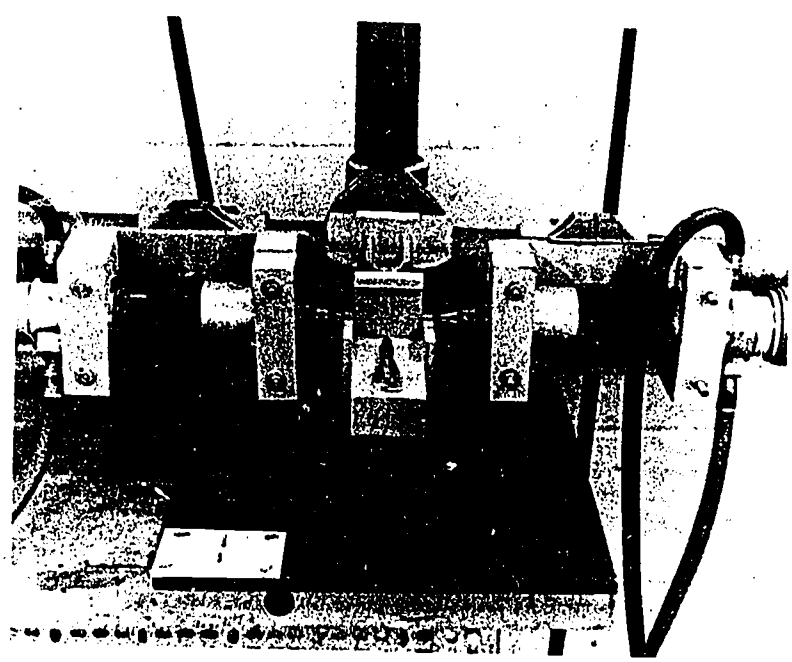


Figure 4. Student-Developed Twin-Automated Pneumatic Drilling Machine

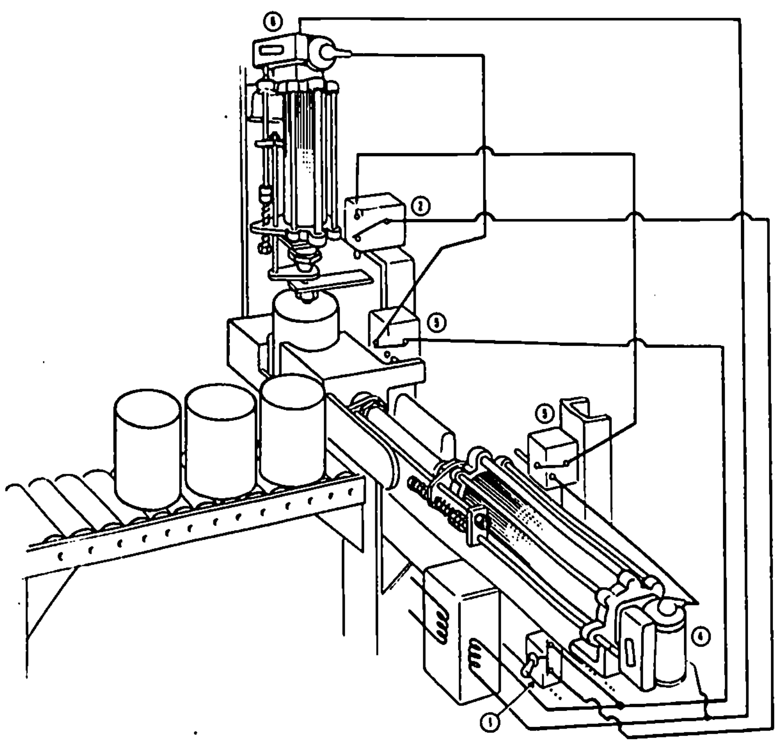


Figure 5. Shop-Built Press with Several Possible Operations

The introduction of control can also be done simply and relatively inexpensively. Control of the feeding operation can be achieved through using microswitches or by using handcrafted switches with contacts that close when a piece of material is moved into proper place. If three switches of either type are used, fairly accurate control of positioning can be achieved.

Handling of the parts to be drilled can also be made more automatic. We have found in our work that students find considerable excitement and challenge in problems dealing with material handling. Perhaps a part of this excitement emerges because it is readily apparent to the students that they are doing something significantly different. Once students have developed even a simple device for feeding something like blocks of wood automatically to be drilled, it is not necessary for the teacher to try to convince them that they are studying manufacturing.

We have seen that in order to achieve even a simple instance of automation, it is necessary to have certain capabilities. These capabilities are identifiable in Figure 5, which shows a press that can be used for a variety of operations. This press was patterned after one that was used to punch out automatically the holes in bottoms of clay flower pots. The same machine could be used for operations such as placing lids on cans, applying labels, stamping numbers, and a variety of other operations.

In all the possible uses of this press, the capabilities of controllable feeding, simple logic for decision making, and work piece control are necessary if the machine is to be automated. The feeding capability is provided by the air motors or cylinders. Automatic feeding is also maintained by the gravity-fed roller conveyor that keeps the work available at the proper feeding position. The logic capability is provided by the switches (2, 3, and 5) and the solenoids and valves (4 and 6). Work piece control is maintained by the clamping fixture that holds the work while the actual process of punching or stamping is completed.

This specific automated machine was presented not only because it included examples of all the elements of automation, but because the machine could be erected and operated at minimum cost. It would be possible to fabricate parts for this set-up rather than to buy all of the components from industrial distributors. As indicated earlier, parts such as those used in this machine are often available through surplus. If the concern for cost resides in the materials that would be consumed, this particular device makes use of simple materials that can be recycled any number of times. For example, coffee cans that use plastic covers to insure freshness once the can is opened make good containers to be used with such an automatic machine.

Up to this point, we have looked at the conceptual elements of automation and at some of the specific automatic devices that could be set up in school labs. Although these facets of the study of automation may be interesting and exciting to students, the power and potential of automation may well reside in its ability to pull together what students learn in other areas. What the students study in electricity and electronics can take on new significance and sophistication as it relates to the concept of control. Many of the activities normally included in lab workbook form can be translated into actual use. The study and use of photocells, proximity switches, thermocouples, and logic devices can all be integrated with the study of automation.

Automation can perhaps best be viewed as a major theme through which a number of specific subjects can be introduced. Other areas of study such as pneumatics and mechanics as well as hydraulics can also be integrated with automation. In this way, a single teacher can have many students come into contact with these subjects and have some students study one or more of the subjects in depth, yet he need not teach them all as separate subjects. The specific instances of automation serve to provide learning experiences for students that require them to know something about pneumatics or electronics and to apply that knowledge toward purposeful ends. Consequently the reality of the learning instance can be designed into the specific activity.

In summary, we would like to indicate openly that it would be unfair to expect all teachers to become knowledgeable in this new area of study on their own. A great deal of work, time, and effort on the part of a number of individuals has gone into developing the study of automation to this initial level shared with you here. Based on the earlier work of Jim Durkin, Doug Stallsmith, Dave McCrory, and Ron Todd, second generation users such as Ray Shackleford, Chuck Campbell, George Samson, and others have shown that automation can be a legitimate area of study. With this backlog of experience, the work of these individuals will be translated into forms useable for other teachers and students as a part of the Automation Study Project. This project, conceived in efforts starting nearly a decade ago, has only recently been pledged funds to underwrite the first steps in this documentation and sharing. We are quite hopeful that if these initial attempts prove successful, additional funding, commensurate with the importance of the study of automation by students, will be forthcoming.

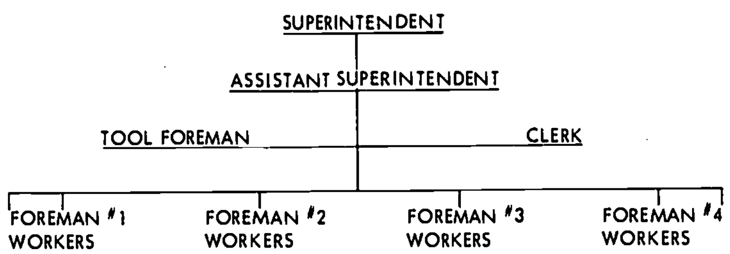
Dr. Todd is on the faculty of New York University, New York. Mr. Campbell teaches at Brady Middle School, Orange Village, Ohio.

Student-Directed Organization in Mass Production

Charles H. Wentz

Manufacturing technology at Ft. Walton Beach Junior/Senior High School is quite different from traditional industrial arts, in that the program incorporates mass production with a student-directed organizational concept. Under this concept, as planned by G. G. VanDeventer, a number of responsibilities are assigned to the students as they perform their work in the laboratory.

The purpose of this paper is to identify the duties and responsibilities of the officers and workers under this organizational scheme. The following chart will help in understanding the names and positions of each officer:



The students may be initially assigned to the various positions by alphabetical order, but this is not important. It is expected that all students will eventually serve in each position as the year progresses. Each Friday means a new working assignment is to be made, and the following Monday begins a new position and role for the students.

RESPONSIBILITIES

A thorough understanding of the duties and responsibilities of each office is mandatory. Under this system, the students are required to identify in writing these responsibilities.

Superintendent

1. Arrive as soon as possible and unlock tool panels.
2. Check for missing tools and report findings to the instructor.
3. See that loose objects on the floor are removed.
4. Check student seating arrangements.
5. Determine if all foremen are present and appoint replacements if necessary. The assistant superintendent may be used as a replacement when needed.
6. Count the number of students present and check the clerk's report for accuracy. You are responsible for the accuracy of this report.
7. Submit report to the instructor and stand by for further instructions.
8. Take charge of class when directed by the instructor.
9. See that foremen take charge of their sections.
10. Maintain order at all times.
11. Check with each foreman at frequent intervals to insure that duties are being performed properly.
12. Alert the foremen when it is time for cleanup activities.
13. Collect daily grade slips from foremen, assign grades to those under you, and report these grades to the clerk.
14. Check on cleanliness of the laboratory.

Assistant Superintendent

1. Take over in case of absence of superintendent.
2. If the superintendent is late, assume responsibility until he arrives.
3. Monitor the clerk and assist him with his responsibilities if necessary.
4. Take accurate and complete notes during the demonstration or lecture period.
5. Schedule retraining time for students who demonstrate a weakness in any area.
6. Help the superintendent keep track of the time. Notify the superintendent fifteen minutes before the end of the period.
7. Attempt to remedy any unsafe condition in action.
8. Keep records on students who have been and desire to be checked out on power machinery.

Tool Foreman

1. Inventory all hand tools.
2. Mark missing tools with a red tag.
3. Check each tool to determine satisfactory operating condition.
4. Report to your regular work area.
5. Observe tool condition when performing final tool check at end of period.
6. Report your findings verbally to the instructor before dismissal time.

Clerk

1. Observe students as they hang their tags on the organizational wall chart.
2. After the tardy bell, enter absentee names in attendance book.
3. Report to your regular work area.
4. Re-establish the organizational wall chart prior to the dismissal bell.
5. Enter grades on weekly grade sheet.

Foreman

1. Assume responsibility for conduct and productivity of workers in your area.
2. Assume responsibilities in a businesslike manner so that your workers will perhaps follow your example.
3. See that workers have proper tools and equipment to do assigned tasks.
4. Maintain safe working conditions in assigned sections.
5. Assume control of section and provide leadership for workers.
6. Assign work to those under you by showing them exactly what to do, how to do it, and by telling them the quality standard desired.
7. Consult with the superintendent and his assistant when problems arise.
8. Submit daily grades to clerk.
9. Direct your workers to clean their area and to return all tools and equipment.
10. Store material according to instructions from superintendent.
11. Keep workers at their stations until final bell and dismissal.

Some industrial arts teachers have attempted to organize their classes in a similar manner as described here, but have neglected to follow up the scheme as new activities are undertaken. This type of leadership can cultivate negligence and indifference instead of responsibility.

Dr. Wentz is an Assistant Professor at the University of West Florida, Pensacola, Florida.

Supervision

Strengths and Weaknesses of Supervision

Herbert Bell

I have been asked to contribute my thoughts on the strengths and weaknesses of supervision as seen from my point of view. I guess my major concerns are in reality indicators of weaknesses, not having sufficient training in order to obtain the tools and skills needed to do the job. One of the nation's management systems outlines the problem quite well using the following example:

Joe is a creative super-operator. He excels on his job. He does more than his share, turns out more production, and is highly motivated in his task. His major tool or resource is himself. When looking for a new supervisor, management naturally looked at Joe. Joe becomes a supervisor, with a new task to supervise and improve production. The trouble is that Joe has the new job assignment, but he has not been given the new skills with which to do it. Thus, he must rely on his old skills, the skills that made him a creative super-operator. Joe will be able to function quite successfully in this new role for about six months, at which time he becomes a detriment to his organization if he is not supplied with the new skills needed to do the tasks confronting him. What he needs, as a supervisor, are the resources and skills referred to in Functions of Management as the ability to plan, organize, and control within specialized leadership. If he has these skills, he will have the respect and cooperation of those he works with. Without them, he is apt to find resentment and resistance. How many times have we seen parallels in education? Probably too frequently to mention. Most educators have a multitude of general skills and are normally talented individuals, but they can lack the specialized training needed to do the job, training that would be of great assistance to them. Perhaps the greatest need lies in the field of interpersonal communications. True, interpersonal communications can smack of sensitivity training, but let me assure you that it differs, for it deals with the ability to listen, to paraphrase, to read group feelings, to deal with nonverbal communication, to match behavior with intention, to listen for feedback, and to understand the strengths and weaknesses of one- and two-way communication. Another approach to this training is RUPS, Research Utilizing Problem Solving, which is similar to IPC. This training deals more specifically with problem identification and solutions, while at the same time utilizing some of the techniques available in IPC. It collects data, plans actions, and seeks alternatives by diagnosing classroom learning environments. Several years ago, another system was being advocated, but apparently has not gathered too much national momentum. It is commonly referred to as the Havelock model. This model again is a system that points to the need for large audiences and their forces, but does not overlook the single classroom. The newest and, in my opinion, the best so far is the system known as Instructional Development Institute or IDI. It is divided into three parts, requiring defining, developing, and evaluating while making allowances for assessing needs, developing objectives, and testing prototypes. At the same time, IDI allows one to utilize skills developed through either IPC or RUPS. You'll find yourself working with groups in this system, not as a teller but as a manager, a manager who assists the groups as they identify their needs and objectives. Too often we find ourselves in the role of tellers identifying strengths and weaknesses, which calls for no commitment on the part of the client. If they are in agreement or the climate is good, you are a hero. Too often, however, you find yourself in the role of a goat. Who does he think he is telling us that? The point I am trying to make is that without the needed training, you have to rely on what you knew as a super-teacher, and in many situations that is not enough.

The second major problem faced by most supervisors is that they are being held accountable for tasks without being given the responsibility or authority to implement. Marshall Van Ostrom, a management consultant, calls this situation crucifixion. Most of the time you will find yourself with responsibility and accountability, but without authority, which differs from the first case since you now have two components of a task. Van Ostrom refers to this situation as an assignment—an assignment of permanent training—since it again does not include the third component, authority, which is needed to qualify a task as a job. This mode of operation normally can trace its inception to school district organization with its reliance on public funds, which makes curriculums secondary to housing kids, buying supplies, and keeping kids in school.

Industrial arts, because of its basic body of industrial knowledge and its close relationship to vocational education, tends at times to isolate itself from general curriculum and instruction improvement. Even the physical location of our facilities lends itself to this isolation. This tendency, isolation, has harmed us, and emergency steps should be taken to remedy this situation. ASCD, Association for Supervision and Curriculum Development, is an organization that devotes full time to probing, presenting, and discussing new directions and innovations in instruction and methodology. The initials ASCD should as well known to you as AIAA. All too frequently, this is not the case. Very few industrial educators belong to this organization, leaving us without the needed understandings and background necessary to keep up with educational technology. It also leaves them with little knowledge about us and our contributions. Instead, we tend to concentrate on inbreeding, and you know where that can lead one if you know anything about genetics—producing idiots. Perhaps one of the most meaningful words in educational technology used today is "interdiscipline." What does general education tell us it means? Where do we fit? What do your indicators tell you? Are we willing to outbreed and get where the action is, or is this a case of others doing to us? It is essential that we know more about general education, understand its directions, its needs, and that we attend, present, and work with other general educators and with ASCD'ers for the betterment of industrial arts.

At the state level, a supervisor has the opportunity of working with many local supervisors. He is in the position to assist these individuals in carrying out their tasks, building them into towers of strength, and at the same time accomplishing his own objectives. The major problem faced by most state supervisors is the lack of local supervision needed for the development of working relationships. In fact, in my state there are more areas without local supervision than there are with. In these situations, you tend to work with either superintendents or curriculum directors. It has only been in recent months that I have taken time to reassess these working relationships and have made the discovery that perhaps I have expended energies on the wrong people, or at least that I am not spending a sufficient amount of time with the building principals. Building principals perhaps hold the key to curriculum change. Sometimes we refer to them in a derogatory manner as "royalties in their principalities," but we must recognize that they control buildings, budgets, release time, travel commitments, and many other functions. Perhaps you also need to look at how you organize your time to see if you are working with the right individuals.

Dr. Donald Thomas, Superintendent of Newark California United School District, recently reported in an Educational Training Management Report that the real responsibility of management in today's school system functions at the building principal's level. It is the principal who is the chief management officer in any school system, and he goes on to qualify that statement. The local building principals develop strong building loyalties, provide direct service to home and child, are knowledgeable of the local school area problems and, added to this, they are the ones who are evaluated and take the responsibility for what takes place in the neighborhood school. You can see that decentralization has always existed, but perhaps will take on added significance in the future. With ideas like this prevalent in the minds of many, it is essential that we work with building principals to develop in them the understandings and knowledges of our programs.

I would like to remind you as I close that edicts like state laws and rules are the poorest method of getting commitment and acceptance, and normally bring about only negative responses. Acceptance—positive acceptance—of any idea or movement starts very close to home, normally in the hearts of individuals.

Mr. Bell is State Supervisor of Industrial Arts Programs for the Superintendent of Public Instruction, State of Washington, at Olympia, Washington.

Strengths and Weaknesses of the Cooperating Teacher Supervision

Russell P. Kellogg

The type of supervision I am about to discuss is that supervision which pertains to the cooperating teacher (term used for "cadet teacher" in the State of Washington).

When I began thinking about ideas to present to you, I went to a number of former cooperating teachers I have had in my program: at the Redmond Junior High School and asked them to give me criticism of the supervision they had.

Their biggest complaint was the shortness of time for the practice teaching period when they had only one quarter (university or college quarter) in which to observe and teach. If they taught in a winter quarter, they did not see the opening of school or the closing of the class. In the industrial arts area, there is a very large inventory, many records, ordering, etc., that they miss if they are not there in the spring quarter. This alone can be enough to discourage a first-year teacher or set him to wondering whether it is worth all the time and effort.

One of my cooperating teachers asked for one year instead of a quarter and was granted this request. I thought you might be interested in hearing in part what he said:

> Each cadet should have one full year of cadet teaching. This is needed for several reasons: to familiarize himself with how the school year is started, to see the student orientation and the organization that is required to make a class a smooth-running unit; to be able to see progress up to the end of a semester, the grading, reporting, etc.; to see how the school is closed, especially in industrial arts, where there usually is an extensive inventory to take and books to order for the coming year.
>
> I believe that each cadet should have at least two to three different class preparations to make. The cadet's school day should probably be shorter than the normal day. The cadet should take some class work through his college or university at the same time. This could consist of methods courses in which he could prepare lesson plans to use directly in the classroom. Classes directly related to the teaching subjects would be helpful at this time. Any classes not directly useful to the cadet teaching situation would be irrelevant at this time.
>
> For the preceding to be successful, cadet supervision must be more than adequate. Cadet supervisors seem to be spread out very thin at most colleges. Teaching of college credit courses taken by the cadet could be the responsibility of the supervisor.

The problems of supervision, as they presently exist in many districts, revolve around the training of the supervising teacher, the training of the cooperating teacher, and the timing of the involvement of the practice teaching, internship, or whatever it should be called.

Many supervising teachers receive no training in how to supervise a cooperating teacher. It presently is done with a lot of love and understanding and trial and error. No courses are offered, no seminars on any level, and no readily available information is offered to prospective supervising teachers. It somewhat depends upon the subject being taught, but some supervising teachers either give the cooperating teacher too much freedom to do as he pleases or not enough to really give him the experience of running a class.

Many times the cooperating teacher is not prepared to teach the subject to which he has been assigned; for example, he may be a good draftsman, but have no electricity or shop training. When he comes into a school that teaches these subjects, he is held to subject matter and unable to demonstrate. Thus, the supervising teacher has to become his instructor as well as his supervisor. This puts a hardship on both the cadet and the school supervising teacher.

Many of the colleges do not offer courses that are applicable to the junior high schools; hence, many of the supervisors from the colleges or universities do not have a sufficient background to do a good job of supervising. By the same token, the cooperating teacher is not familiar with the subject matter, either.

The supervising teacher in a school system can do a better job if he has had many years of experience, yet is familiar with the new programs, methods, etc. The supervising teacher can do much to ease this teaching year for a cooperating teacher.

I would like to mention two positive approaches to this matter found in the area around Seattle.

First, consider the North Shore District's approach. The academic subjects that are to be taught by the cooperating teacher are taken before the teaching begins. In the fall quarter, the student observes and teaches in the mornings. He receives 9 credit hours. In the afternoons he takes his one required methods course or educational statistics course, a course in learning teaching strategies, or any courses needed to fill out the college requirements. The second quarter he earns 18 credits and teaches full-time as soon as possible. He is now working with a provisional certificate, so the liability problem is satisfied. At the end of the second quarter, the secondary cooperating teacher has completed his "in the field" requirement.

The second approach is in the Lake Washington School District at the Rose Hill Junior High School, Kirkland, Washington. Following is an excerpt taken from the March 22 issue of the East Side Journal, Kirkland, Washington.

> A new concept of teacher training in the State of Washington may be developed as a result of a pilot program being conducted at Rose Hill Junior High.
>
> "No specific training for the junior high level is provided in most college curriculum today, and this is badly needed," Al McCaffrey said. "We are conducting a field work program with Central Washington State College as a special project. Our teacher interns have actual experience in the classroom for a year and also attend college classes to learn specifically about the junior high age student." McCaffery, a RHJH teacher, is project coordinator.
>
> The five prospective teachers are on a federally-funded Education Professions Development Act program and, after successfully completing the training for one year, will be accepted for certification in this state. The teacher trainees receive a stipend of $1200 under Title II of the Higher Education Act of 1965.
>
> "Our main objective was to offer an experience in team teaching and individualized instruction in a junior high school with a humanistic environment, which we feel this school has developed since it opened three years ago," he added.
>
> Each intern works under a master teacher but learns techniques from all teachers in the department. They also observe classes in other elementary schools in the district. They will do their practice teaching during the spring trimester at Rose Hill Junior High.
>
> Working with instructors from Central Washington State College, the trainees attend a series of all-day classes during the year for college credit. These classes have also been available to the staff of Rose Hill Junior High for in-service training. The project also involved the training of eight para-professional teacher aides at the junior high level for a 12-week period.
>
> This project may serve as a test of the new certification law of the State of Washington passed in July 1971, which will require one year of internship in the future.
>
> The interns indicated that they felt much more confident of their ability to cope with a junior high class after gaining experience over a full school year.

Even though there are weaknesses in the program, the cooperating teachers feel that it is the most valuable methods course in their educational field.

Mr. Kellogg is a member of the Redmond Junior High School faculty, instructor in industrial arts, Redmond, Washington.

The Vision in Supervision

Homer B. Towns

I'll be the first to admit that there is indeed much discussion today about the question of supervision in industrial and vocational education. But I am quite serious when I say that the strengths and weaknesses of supervision are very important to me, especially when I consider the rapidly changing educational requirements. There is a real need for some serious, straight-forward examination of just exactly what the role of the supervisor really is. The dictionary defines "vision" as the ability to anticipate and to make provision for future events, to have foresight and imagination. That is, I believe, pretty much what the "vision" in supervision should be. That is, in fact, what I think it has to be.

We must recognize that educational theories and practices have changed drastically. Commensurately, so has the supervisor's role changed. There has been a dramatic shift in the concept of supervision, from the rather vague ideas of the past to the sophisticated, complex programs of today. The man that kept the wagon wheels rolling has no place in directing a rocket ship to the moon. The one-room-schoolhouse man has no place in today's multi-versity concept of schooling. I am not saying that the over-all purpose of supervision has changed completely, because it has not. Today, as yesterday, the supervisor's purpose is to take progressive programs and make them work on a practical level. But I am saying that the specific requirements and methods of supervision have changed.

For us in industrial and vocational education, the main concern of supervision is to make sure that the quality of instruction is constantly improving, because if the instruction does not keep pace with the rapid changes which surround it, then the entire program will fall far behind. Just how the supervisor is to insure this improvement is not an easy question to answer. There are today as many approaches to the problem of supervision as there are educational theories; and this, I think, is pretty much as it should be. Each particular school system requires its own particular kind of supervision. This is brought about by the diversity and complexity of American society itself—a diversity and complexity which seems to increase daily. As society grows more complex, philosophies of elementary and secondary education change in an effort to keep pace. Consequently, the organizational and personnel patterns of our various school systems have become increasingly perplexing. No two areas or school systems can function under a carbon-copy program. A program that works beautifully in Chicago probably would not work at all in Tulsa. Or one that sets records in New York City may fail miserably in Dallas.

I do believe, however, that there are some general expectations that can be required of all supervisory programs, no matter where the programs are initiated. I say this even though I know that articulating a good, sound program of supervision is more difficult today than ever before. But then it is more important today than ever before.

When we talk about supervision, we are actually talking about supervisors—individual men who must confront a very difficult job. Any program of supervision is only as good as the supervisor himself. The supervisor must work with many different people at many different levels—the federal level, the state level, the local level, and, perhaps most important, the personal level. Unless the supervisor himself functions well at each of these inter-personal levels, the entire supervisory program suffers. And the program as a whole must work well on all these various levels. Like the proverbial chain, any supervisory program is only as strong as its weakest link. And the effectiveness of the entire program depends entirely upon how well the supervisor himself can perform on each and every one of these levels. So, to generalize a bit, we may say that the important—no, the essential—strength in supervision is the supervisor's ability to work efficiently and effectively with other people.

More specifically, I believe that the work of the supervisor can best be done if he recognizes several requirements of his profession. These apply to any supervisor, whether he be working in administrative or curriculum capacities. If a supervisor can fulfill these requirements, he will be successful in working smoothly with the people with whom he is involved, and his total program will be greatly improved.

First and foremost is leadership. Leadership can be defined in many ways, but for industrial and vocational education supervision, leadership means having initiative, setting meaningful goals, and stimulating the talents of his coworkers. It is supporting teachers when changes are made that may disrupt their usual routines or methods, making sure that the administration is properly informed about innovations, so that these innovations will be understood and accepted. No supervisor can expect his administration to accept programs that he himself does not fully understand or cannot intelligently explain and justify. In short, the supervisor must provide leadership in all ways. He must create innovative programs. He must convince the administration that those programs are worthwhile. And he must see that his co-workers understand the program and achieve the established goals.

It is in leadership that weaknesses are most often seen. Supervision as a whole has been weakened because we have not been as innovative as we should be. We have not had the vision, the foresight to anticipate and prepare for future events. This is true not so much because of a lack of potentially good supervisors as because of a lack of money. Particularly in some smaller schools, inventive programs have been absent. In contrast, many of the larger schools have received federal grants which have made it possible to implement creative and forward-looking programs—programs much better than would have been possible without the federal money. I personally hope that more federal grants can be made available to more schools so that they too will be able to re-evaluate their present programs. It stands to reason that the schools with the most money for progressive programs will get the best leadership, and only the best leadership can come up with the innovative ideas needed to sustain the vital progress of our school systems.

Coordination, another essential quality of the good supervisor, is really a part of good leadership, and it involves the total school system. The successful supervisor must be alert and resourceful, and he must engage in staff coordination and have a clear grasp of the aims that he and the administration have set for the school system. Unless the supervisor can coordinate all areas of his program, he will soon find that the various aims and people of the program are going off in different directions, and the entire program will disorganize itself into uselessness. Just as an example, take a very basic problem — the material needed to carry out the various facets of the supervisory program. The supervisor must at all times keep a check on the material and have it under control. He must know where the resources are and make them readily available to the people who need and want them. This is a very basic requirement, but it is one of the biggest problems that a supervisor faces. And he must not only face it, but overcome it.

In speaking of resources, we must realize that the supervisor himself is a resource. His experiences and skills are placed at the disposal of the entire system. And the program he is trying to formulate is only as good as his store of knowledge and abilities. In short, the supervisor must have some expertise in all the fields in which he is supposed to be working. One of the best ways for the supervisor to gain or expand his expertise is by taking part in conventions and by visiting other school systems. It can also be expanded simply by talking to other educators within the profession and by sharing ideas and experiences. The supervisor who thinks he has learned all there is to learn about his field is no supervisor at all. He must at all times compare his programs to the programs of other supervisors and systems. And he must be resourceful enough to recognize new concepts and methods when they are presented to him. All the new ideas may not work for his particular program, but he must nonetheless examine them all and adopt those which he finds worthwhile.

One of the best ways for a supervisor to implement new ideas, and thereby insure continued improvement of his program, is through in-service education. The real strength of a supervisor can be measured in large part by the effectiveness of his in-service programs. If the supervisor fails in establishing good in-service programs, chances are he will fail in establishing any program at all. Through research, travel, and continual re-evaluation of his over-all purposes, the supervisor can learn to sift away all the nonessentials and to bring to his teachers valuable information in its purest form. He must present his teachers with this information through effective in-service programs, make sure that the teachers clearly understand the information, and then see that they pass it on. This is what in-service training is all about, and the supervisor must learn to handle it efficiently and expertly.

Efficiency, of course, involves time, and any evaluation must take into account the time factor. For the supervisor there is never enough time—or at least there never seems to be. The typical supervisor spends about 50% of his time coordinating programs, working with teachers, other supervisors, and the administration. Thirty percent of his time is devoted to in-service or curriculum development. The remaining 20% of his time is spent in public relations, travel, and general office activities. This may not be enough time for each of the duties involved, but it is all there is. And sometimes, because he feels the pressure of time, a supervisor tends to become a first-aid man. He spends what time he has in doing a patch-work job on all problems and as a result never comes up with a real solution to any one problem. He tries to accomplish with Band-Aids the things that he would be fortunate to accomplish with a team of surgeons. To avoid this haphazard approach, the supervisor must learn to make the most of the time he has. He must evaluate every phase of his program and devote the proper amount of time to each. He must evaluate quickly and intelligently a diversity of things—films, books, instructional programs, material production. He must learn to allocate the material needed by his instructors, keep track of how this material is being used, and then decide how much progress is being made through the material's use. All this requires time, so the time which the supervisor has must be used wisely. A supervisor must evaluate everything—and the thing which he should perhaps evaluate first is his time and how he uses it.

Fortunately, it appears that the administrative functions of the supervisor are being reduced so that he may work more with his teachers and staff. This is a good trend, for it makes the supervisor's relationship with his personnel much more effective, and it gives him more time to judge the teachers' capabilities and interests. But even with less time consumed by administrative duties, the supervisor will still find that time is a scarce commodity, and he must be somewhat of an efficiency expert to employ his time productively.

The points I have mentioned are purposely general and apply only to the supervisor in general. What must be done within each system is for the job of the supervisor to be defined. The administration of each school system must formulate a fairly specific plan that fits that particular district. The administration must make it clear what the existing weaknesses and strengths of its system are. It must clearly define what goals a supervisor is expected to reach; and it must establish the exact conditions under which the supervisor will be working. Only after this is done can the individual supervisor create his own program to fulfill the over-all goals. We might compare the supervisor to a ship's captain. The ship itself is owned by the Navy, controlled by the Navy, and the Navy tells it where to go and when to stop. But once at sea, the Captain is boss, and only through his leadership or lack of leadership will the mission succeed or fail. If the ship is sunk before reaching its goal, then the captain is to blame. There are a lot of different ships and a lot of different captains, but the goal of them all is the same—to reach a definite destination and to deliver the goods, whatever they may happen to be.

It is clear, then, that the supervisor's role is difficult and complex. More and more he is finding his proper place in our complicated educational system. But in order to keep pace, the supervisor must be a man with vision—a man able to anticipate the future and to map a clear-cut and practical way to get there. I do not claim to have presented solutions to the problems that confront supervisory programs, but I do hope that I have presented the main points of identifying the strengths and weaknesses of supervisors.

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Teacher Education

College Cooperative Work Experience

Albert R. Squibb

In 1906, Dean Herman Schneider of the University of Cincinnati managed to get 12 local industries and the university to share in the education of a group of 27 young engineers.

First to follow Cincinnati in the adoption of cooperative education was the Polytechnic School of the YMCA Evening Institute in Boston. This school was the beginning of Northeastern University. Today Northeastern is the largest school in the country to operate largely on mandatory cooperative education.

Following closely were such schools as the University of Pittsburgh, University of Detroit, Georgia Tech, Akron University, and MIT. By 1926, the Proceedings of the Society for the Promotion of Engineering Education listed 18 colleges and universities with co-op programs.

Up to this time co-oping had been largely engineering in nature. However, in 1919, the University of Cincinnati made some first steps to expand co-oping into wider areas. The College of Commerce was merged with the College of Engineering, thus extending cooperative education into the area of business administration.

The growth of cooperative education has been steady and not without problems. For instance, when a recession hits and industry has to lay-off, generally the co-ops are the first to go. Nevertheless, growth has taken place, and today about 250 institutions of higher learning have some kind of cooperative education program. It is predicted that within 10 years, 700 colleges and universities will have programs with 500,000 active student participants.

Just as the number of institutions has grown, so have the numbers of major classifications. We have already noted the early growth in engineering programs; as time passed, more areas were included, until today there are over 150 major classifications, everything from accounting to education to industrial technology to upholstering to zoology.

So much for the short historical view of cooperative education; let us now turn to an over-all picture.

Much of the information relevant to a complete picture of cooperative education may be found in the pamphlet, "Guidelines for Colleges Considering the Initiation of Cooperative Programs." I have based this section of my presentation on adaptations of that pamphlet.

For some of you who may be in doubt as to what is encompassed by cooperative education, this definition may help. "Cooperative education is the integration of classroom theory with practical experience under which students have specific periods of attendance at the college and specific periods of employment."

By way of implementing the definition, the following should be adhered to as closely as possible:

1. The student's work should be related to his field of study and individual interest within the field. For instance, in our industrial technology program, most of our students will co-op in such areas as line supervision or product engineering.
2. The employment must be considered to be a regular, continuing, and essential element in the educational process. Also, some minimum amount of employment and minimum standard of performance must be included. We at Ohio University will not consider just any type of job for co-op experience. We are aided in the minimum performance evaluation by the participating companies.
3. The working experience will ideally increase in difficulty and responsibility as the student progresses through the academic curriculum.

It might be well to add in passing that what we have just discussed satisfies only one of three different objectives given by some authorities. The objective that we have just described is professional development; in this objective, programs are built around the student's major area for the purpose of giving him experience in his field.

The second objective is personal growth. Here programs are built around areas other than the student's major for the purpose of broadening experiences. For example, a language major working as a store clerk.

The third objective is financial aid. In these programs, the student works to provide income to finance his education. I, personally, find this last one really stretches the definition of co-op education.

When I first encountered these three objectives, I thought them to be integral parts of a good program of professional development. In other words, the student not only develops professionally, but is aided financially and develops a degree of maturity.

I would like to continue by pointing out some items that need to be considered in establishing a co-op program. I will use examples from our successes and failures to illustrate some of the points.

CALENDAR

Will the program be operated on the quarter, semester, or trimester basis? Actually, we have had little trouble here. We started on the semester plan and then the university switched to the quarter plan. Most of our employers are working under both plans, so there was no problem here. Probably our biggest problem was how to get the time into a four-year block. Some schools require five years to complete a degree if the student co-ops. We felt that we would have very few takers if we required five years. I have prepared a transparency that shows how we work the plan in four years. Obviously, our granting academic credit helps.

ADMINISTRATIVE PROBLEMS

Such things as housing contracts, athletic participation, and campus positions need to be considered. At Ohio University, we run, I've heard, the fifth largest dormitory system in the world. The upper administration likes to keep these dorms full to pay the bonds and, therefore, are extremely reluctant to let students out of their contracts. So far, we've had no particular problems. Likewise, we have had some students who play football: this commitment means that the student must be on campus in the Fall and Spring quarters. How about the person aspiring to campus office? We've found this person reluctant to schedule co-op work. The same thing is true with the social life that is to be found on campus.

FACULTY CONTRACTS

We have experienced some problems here. Ideally, the person responsible for co-op students will be available when students are on the job; however, I'm only on a 9-month contract and, generally, one summer term. We have solved this by having the departmental chairman, who works summers, handle the load during this time. I can see further problems here if our program should expand. One obvious solution is to have more people working in the program. This leads very logically to the next point.

COORDINATORS

Currently we are running the program on a part-time, part-load basis. This probably works out on a small number, optional-type program but as the students and, hopefully, the university sees more good in such a program, the need for full-time coordinators becomes apparent.

OBJECTIVES OF THE PROGRAM

The three objectives have already been briefly discussed, but it will be necessary for a new program to spell these out.

RULES AND REGULATIONS

Under what conditions are students eligible? We try to get the student sometime in the sophomore year, but they must have had some work with us prior to the first co-op quarter so that we are aware of their capabilities.

How do we treat "failures" on assignments? Is there an appeal procedure that a student can use when he is not satisfied with a decision? Is the program flexible?

CONTACTS WITH EMPLOYERS

Knowing the feasibility and availability of jobs at an early date is of great importance. Our initial contacts were with a company that employed a few of our graduates and had co-ops from other schools for many years. It was almost a "bootstrapping" operation,... a word here, a lead there. We are now at the point that a few companies have contacted us as to the availability of students for co-oping.

CREDIT VS. NON-CREDIT

Will your program offer credit for off-campus work? I believe we could classify our case as "even a blind pig stumbles across an occasional acorn." By this I mean, we submitted a proposal to the various curriculum committees as a new course offering with appropriate credit. After some questions concerning the policing of such an offering and giving assurances that student reports, company, and departmental evaluation would be given, we were permitted to add this to our curriculum. I have since found out that schools that grant credit for co-oping are the objectives of much envy of most non-credit programs. I, personally, believe that the credit given is generally more meaningful and harder earned than some of our on-campus courses.

I would now like to turn my attention to the cooperative education program in Industrial Technology at Ohio University.

Basically, our program may operate in either of two areas, namely, our Engineering Option and our Production Option. It is possible to get a maximum of 15 quarter hours credit toward graduation.

This credit may, with certain exceptions, be gained under one of two plans. In Plan "A," the student gains his own employment, normally during the summertime, and is limited by the following specifications.

1. The job must be of such a nature that the participant will be directly associated with hourly employees who are performing the productive work in manufacturing or construction which is the major activity of the company. Duration of employment must be at least 8 weeks for credit to be awarded under this plan.

2. The organizational pattern within companies which will be considered for approval under this program must include grouping of hourly employees under direct leadership of salaried foremen or supervisors.

3. Each participant is expected to develop at least one suggestion on improvement of work processes, tooling, or material. This is to be submitted to his employer, with copy to the Department of Industrial Technology. Forms may be obtained from the Departmental Office when company forms for the suggestion program are not available.

4. Completion of the course INDT 260 is required prior to participation in this plan. Application forms may be obtained from the Departmental Office, and these must be filed after the position has definitely been obtained, but no later than 4 weeks prior to completion of experience on the job.

5. Credit is limited to a total of 3 quarter hours.

6. A written report is required early in the quarter following the experience.

7. Grading will be in the form of CR for credit.

Plan "B" is the more formal program, where selectivity and prior approval by both the department and the company are necessary.

The main points of this program are as follows:

1. A definite program of training must be agreedupon prior to the starting of the work experience.

2. Periodic (usually monthly) reports will be required during the experience.

3. A definite letter grade will be assigned through observations, review of reports, and consultation with the employer.

The Plan "B" student gets into the co-op stream by completing the application form. As noted earlier, we want to know a little about the student before we send him out. We have quite an array of courses listed; he need not have completed all of these courses, but will probably have completed most of them.

Next, we have the Work Experience Report that each student on Plan "B" must complete during his experience. Due dates for these reports are given to the student during the first week of class. Generally, 2-3 reports are required per quarter.

Prior to the latest recession, we were sending out about 6 to 8 different students per year to 7 different companies. This dropped sharply during the last 2 years, but now seems to be on the rise. Within the last month, 2 companies have sent requests for Spring and Summer placements.

The following are what I consider "probable directions" for cooperative education.

More Federal Aid. I won't argue the point whether or not this is a valid use of the taxpayer's money. I will only make the statement that this is almost certainly going to increase. According to the Cooperative Education Association, in 1970-71, the actual amount of money available under the Higher Education Act for cooperative education grants was $1.5 M and for 1971-72 was $1.6 M. Rather small, I think you will agree, by the usual federal standards; I understand that an appropriation of $10 M is now being considered for the coming year. Anytime you see this much increase, you are bound to see an increase in interest in the program.

Wider Faculty Participation. To date, there has been little done to involve faculty in cooperative education; indeed, faculty members frequently view co-oping as second-rate. Co-oping is seen as not of the caliber of real "intellectual development." (Roughly translated—"Not nearly as educational as my lectures.")

I believe there will be efforts made to realize that the classroom and the co-oping experience can compliment each other. For instance, we at Ohio University require that the student alternate quarters of campus activities with work experience so that the co-op can put his new-found knowledge to use in the class with his peers; (i.e., new methods, new machines, and new products will supplement the formal class instruction).

Employer Education. Employers are the lifeblood of a cooperative program, but to date very little has been done to educate employers as to how to participate effectively. If the student and the employer are to get the utmost benefit from the experience, then more needs to be done along this line. Unfortunately, some employers look on this experience as a way to get cheap labor, or at best an easy recruiting gimmick. To me, there should be more emphasis on a well-rounded, educational introduction to the industry. I should hasten to add that several companies do this now.

Student Economic Considerations. We have found that many of our co-ops will earn enough to almost pay for their next quarter on campus. I believe this facet of co-oping will play an increasingly important part in college work as tuitions keep rising and available loan funds keep diminishing. Besides this, a co-oping experience generally makes the student more saleable after graduation.

Expanding Role of Cooperative Education. Traditionally, cooperative education has been heavily engineering-oriented. Earlier in this presentation, I mentioned the number of major areas now engaged in co-oping. I look for the percentages of students in non-engineering cooperative education to continue to grow. Getting closer to home, we at Ohio University have tried, with little success, to have our industrial arts students gain cooperative education experience. After all, who needs it more than those who will soon be translating industry to our children? Incidentally, in 1970, Robert Shorb of Long Beach, California, did a study concerning work experience for industrial arts teacher trainees. His study showed that of 184 institutions replying, 83% indicated work experience would be valuable; however, out of these 184 institutions, only 20 had work experience programs available to prospective industrial arts teachers.

Also, how about cooperative education for educationally disadvantaged students? What better way to break them into the rigors of education than by interspersing their classroom concentration with time to absorb and reflect in a different atmosphere?

Obviously, from all that I've said, I see a great future for cooperative education. I see it as more than just a financial crutch, more than just a recruiting gimmick for industry; I see it as a real, live, dynamic part of education. Which is, after all, why all of are here in Dallas at this time.

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Keeping Up With Change in Teacher Education

Willis E. Ray

Most of us, during our early years, were raised in a relatively stable world. Many of our thoughts and actions are deeply rooted in that past. But—fortunately or unfortunately—we live in the present, and our professional efforts will affect generations to come. The present is an exciting time—a time influenced by change in all facets of our society. What the future holds for mankind is the subject for much conjecture. We have been told that "change" will be one of the most pervasive elements of our future.

What does all of this mean for undergraduate industrial arts teacher education? If we agree that future teachers leave our colleges and universities and teach the way (and what) they were taught, then we had better take a long, hard look at our undergraduate offerings.

In the 20th Yearbook of the American Council on Industrial Arts Teacher Education, published by McKnight and McKnight in the spring of 1971, Professor Jerry Streichler and I (as co-editors and authors) attempted to point out that it is entirely possible for some of the pupils of some of our present "crop of teachers in training" to be citizens of the 22nd century. Now, if teachers tend to teach the way they are taught, think of the effect of our professional efforts on future generations! We made a strong case for teacher educators to thoughtfully project new approaches to our technical content—industrial technology, or perhaps the technology <u>in toto</u>. Also we called for the profession to consider creative ways of studying and teaching the "methods of teaching." By improving the components of content and method now in our undergraduate programs, we will effect positive change for many years to come.

In my opinion, one of the severe weaknesses of undergraduate education involves our content or subject matter base. Our technical content is a reflection of the past in the mirror of the present. We continue to organize and teach courses in drawing, woodworking, and metalworking, not because they reflect contemporary industrial technology, but because our past—our history—has guided us in this path. There is nothing inherently wrong with drawing, woods, metals, graphic arts, plastics, etc., but they must be considered for what they are—parts of larger "systems." To better meet the demands of the future, we should prepare our undergraduates to understand and be able to teach youth the elements of a larger system—industrial production. In addition, our undergraduates should be able to teach the elements of another companion system—industrial management.

For several years, now, I have been a part of a team that has developed instructional materials (systems) for a study of industrial technology—management, personnel, and production elements of industry—construction and manufacturing. These materials have been exceptionally successful in schools with children and teachers. Because of their success and effectiveness, many colleges and universities, including my own—Ohio State—have modified their program offerings to embrace, or at least partially embrace, the concepts, principles, generalizations, and unifying themes that are a part of these IACP instructional systems.

In addition to the technology of industry, other technologies, such as communication and transportation, may be similarly conceived, developed, and tested in schools. Then, assuming success, collegiate programs should be developed to prepare our undergraduates to teach these concepts and principles.

Another major weakness has been our so-called methods courses. These have been mixtures of hints, hunches, and hearsay. But with the pending development of performance-based modules of the teaching act and related (supporting) teacher activities, the future looks brighter in this regard. Under a USOE grant to the Center for Vocational and Technical Education (officed at Ohio State), in cooperation with the University of Missouri and Oregon State University, such modules of instruction are under development. When available, preparation in so-called "methods" may be much stronger.

Speaking of performance or proficiency modules, this raises the entire question of our traditional organization of undergraduate programs into four years, eight semesters or twelve quarters, and a series of content and methods courses. Although there may be some logic in the present sequencing of most courses of content and method, exit from any one course and entrance into any other course are not based upon performance in any precise sense. Hence, our undergraduates enroll in "courses" whether they need them or not and move through them, over a four-year period, en masse instead of being allowed progress at their own rate.

Up to this point, I may have sounded a bit negative—stressing several weaknesses in our undergraduate programs. There are, however, many strengths in our programs. Briefly, these include improved physical facilities, better prepared professional staff, increased cooperation with business and industry, and developing professional organizations. When increased effort is placed in curriculum (both content and method), we should realize a true leap forward.

Now let me turn to some trends in education that may call for changes in the ways we are conducting our undergraduate programs. Admittedly, the trends identified may call for short-range rather than long-range planning and change, but they are no less important than the curriculum questions discussed previously.

First, we appear to be on the threshold of an "instructional materials" revolution. In the near future, more packaged instructional systems will be available to the teacher. With such materials, many developed for self-paced instruction, the teacher will be set free to become a true professional—one who has the opportunity to work with individuals to diagnose and prescribe educational "treatments." In our teacher preparation programs at the undergraduate level, we should provide opportunities for prospective teachers to use, evaluate, create, and modify such instructional systems.

A second trend that will affect our undergraduate programs is the increasing emphasis upon "bargaining" within the teaching profession. Not only will salaries and working conditions be negotiated, but curriculum and program offerings in the schools will be established by local education (or labor) groups. Surely this will have an effect on the influence of college programs.

Third, we are entering a period where the relationship between supply and demand will more nearly approach a balance when compared to the last two decades. Because the supply will approach or exceed the demand in the next few years, according to many authoritative predictions, teacher educators will need to more carefully select incoming students. In addition, early field experiences will need to be used to identify those really interested in teaching so that those who have made a poor choice will leave the program for another career. With the volume of undergraduates reduced, more staff and program time can devoted to improving graduate and in-service education.

The fourth and last trend that I will identify is that of so-called educational renewal sites and renewal centers. If plans of the United States Office of Education are implemented in the next year or so, monies will be provided to "sites" (areas with about ten elementary and secondary schools serving 5,000 children) and to centers (now thought of as state-level organizations) where teachers and other school employees will come together for in-service training and to exchange ideas and learn to use innovative programs. The focus for all teacher education may change from the college or university to such "educational cooperatives" or teacher renewal centers. What role will our colleges and universities play, if any? Only time will tell—but this national planning by USOE will force college professors to "shape up" their activities and programs.

These are exciting times. Change is occurring and will accelerate in the future. Teacher education in industrial arts as we now know it, with all of its strengths and weaknesses, may take on a whole new look, if we are up to the task.

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Industrial Teacher Education Curriculum (ITEC) at Arizona State University

Joseph J. Littrell

The community college movement has increased the problem of identifying and encouraging capable students to consider industrial arts teacher education. Yet it has generally improved the technical competence in the subject areas. Many community colleges have been able to develop very fine technical laboratories. Where the two institutions have been able to coordinate, it becomes the place of the four-year institution to give such instruction as advanced technical studies, instill a philosophy of and a drive for teaching, and to provide the teaching methodology.

Students enrolling for the first time in industrial arts teacher education at Arizona State University are a conglomerate, as they vary from freshmen just out of high school to community college graduates who register as juniors. The ages of any entering class may vary from 17 to 47. Work experience by individuals may be virtually none to that of a practicing journeyman machinist.

To cope with this heterogeneous group of students new to our institution, several professors and graduate students met during the 1970-71 school year to examine conventional and innovative programs for industrial arts education. After much discussion, these men voiced their dissatisfaction with the then-existing program and put together a plan which eventually was called ITEC, an acronym for Industrial Teacher Education Curriculum. ITEC is basically a plan to improve the preparation of industrial arts teachers for the schools of Arizona today and for the schools of Arizona in the future.

The pattern for industrial arts courses in Arizona's secondary schools during the 1960's was primarily based on classical areas of specialization. These are commonly found as courses in wood, electricity, plastics, metal crafts, power, drafting, graphic arts, and transportation. This classical pattern has done its job well and will continue to be used for some time. Yet, it now appears that there are two major industrial arts thrusts, one for grades 7-10 and one for grades 11-12. The more advanced grades are perhaps best served by the in-depth study of the more classical approach.

However, the ASU planning group felt that preparing for the classical was not enough to meet the current and future industrial arts teacher needs if ASU graduates were to cope with revised programs in schools. It is difficult to get away from "Now when I took industrial arts in high school," but look to the future we must.

Future education systems will be unlike current ones; however, it was the ITEC planning group's view that traditional and contemporary industrial arts objectives should be considered. These were accepted, but what was needed was a different approach, where future industrial arts teachers could exercise their capacity to solve problems related to instruction in the classroom and laboratory.

After gaining some direction, the next part of the program planning was to try out a one-semester ITEC plan. First, a 10-semester-hour block of industrial arts courses was scheduled h faculty members agreeing to participate on a trial basis. Four of the required cours. re finally locked into a schedule for only 25 ITEC students. Students received initial instruction in the five course areas of wood, metal, plastics, power, and design.

After about three weeks, every attempt was made to break down, lose, or forget these specific technical areas. This then became a transition period, with students freer to move between laboratories according to their needs. A full student schedule of 17 semester hours was easily available, and students have had less problems registering.

The daily schedule offered a block of 18 periods per week available in ITEC. This gave greater flexibility for instruction, laboratory work, field trips, and less student interruptions in setting up and clean-up. Hopefully, the ITEC has helped to bring about greater "togetherness" and "esprit-de-corps," as well as a working relationship not possible before. Problems have arisen, such as availability of laboratories and faculty, but it is hoped that these will improve with time.

During their subsequent semesters, ITEC students are expected to gain mastery of skills and technical knowledge along with their professional education and general studies courses. This ensures that they meet, compete with, and work with students of other disciplines.

First semester of their senior year, ITEC students enroll in special methods, curriculum, and a seminar on contemporary industrial arts with emphasis on the American Industry Project and IACP. The second semester requires one half day for student teaching.

With graduation, ITEC students receive a bachelor of arts degree with a major in industrial arts education and a secondary education teaching certificate that enables them to teach grades 7-12 in the Arizona schools. It is expected that ITEC will not only produce better teachers for Arizona's rapidly moving industrial arts needs, but at the same time have a greater holding power to graduation for those in teacher preparation.

During the orientation period of the first semester, ITEC students are given instruction in the use of a variety of tools and machines, and an attempt is made to relate processes in such a manner that they may be applied to any materials.

Safety instruction, use of equipment, and individual instruction is given in the orientation period, but design and planning are really given special attention. Students are presented with a design process and are expected to work with ideation to come up with solutions. Problem solving is expected in groups and individually. Learning the processes and learning to teach others go together for ITEC students.

PERT becomes part of the ITEC student's vocabulary. Proposals for a project are submitted, the project is approved, and carried through an enterprise experience with a progress report, including Project Evaluation and Review Techniques (PERT chart).

The enterprise experience becomes a major emphasis for six weeks. The schedule of 18 periods per week allows concentrated effort for ITEC students on the enterprise study of management, production, marketing, finance, and labor.

The electronics industry and other "key" industries are well represented in the Tempe-Phoenix metropolitan area, where ITEC students have an opportunity to visit such companies as Motorola's Government Electronics Division or Honeywell General Electric's Computer Plant. ITEC students are made aware of various facets of finance, such as sources of funds, interest, loans, stocks, dividends, and wages. Students face problems in obtaining capital to carry on an activity. Stocks may or may not be sold, but regardless, records must be kept.

Producing a product is only part of enterprise. Is there a demand for it? How can it best be marketed? An opportunity to get involved in marketing their own products provides ITEC students with a simulation experience in distribution and sales.

Consultants are frequently called upon to talk to ITEC students about special subjects, such as marketing. Stock brokers, motel owners, and economic educators are examples of consultants used.

Labor and labor problems are studied with current events involving labor as a focal study point. Although successful, an enterprise may still have labor problems. Management's side is considered, and students are exposed to the structures and levels of responsibility in a company through organizational charts and class discussions.

As students move into the production phase of enterprise, they prepare flow charts prior to the culmination of production. This is where they verify their planning and preparation. When completed, ITEC students explain the production of their group's project to each other. This includes whatever jigs and fixtures were needed as well as the design and implementation of the product. In addition, a written portfolio is required of each enterprise group, including a PERT chart, drawings, and descriptive material.

After the enterprise unit, ITEC students are expected to carry on with individual work for another six weeks. Although students are in ITEC for 18 periods per week, most request many additional hours of laboratory time. As part of their individual activities, students are required to work with several kinds of tools and encouraged to gain as many different experiences as time permits. Then, as the individual projects are completed, time is set aside for oral reports. A follow-up evaluation of each other is an important part of ITEC.

The ITEC faculty team includes several professors and senior students who are selected to join the faculty. This team meets for lunch once a week to evaluate the week's work and plan for the next week. Individual instruction is provided when needed in order to help the teaching intern, who receives credit for his experience. Future interns will be selected from those who have been ITEC students.

Since many graduates will find it necessary to obtain employment in such programs as the American Industry Project, IACP, general laboratories, and with career education, ITEC students look more closely at these contemporary programs during their senior seminar and in summer workshops.

ITEC students discover that career education extends into the college level, too. There are a variety of opportunities for industrial arts graduates. Examples are: vocational rehabilitation; Peace Corps; vocational evaluation; manual arts therapy; special education; and education in industry, as well as with public schools and colleges.

In summary: How is ITEC different from the former industrial arts teacher education program? For one thing, a student has a chance to start his program of studies with a broader view of industrial arts education. Flexibility is an important word in the program. But perhaps communication is an even more important factor, since ITEC means that professors, new students, and senior students plan together.

ITEC ensures that everyone has a chance to learn and to openly discuss problems and questions as a team approach. This is the first of the five ITEC goals. Student retention is expected to be better, as we hope that each of the first 25 stay to graduation. The third goal of a versatile teacher applies to the university faculty as well as our future graduates. Fourth represents a look at the contemporary programs, and with each passing year there will hopefully be newer contemporary programs for industrial arts education. And last, there must be positive carry-over from the industrial teacher education curriculum to the public schools of Arizona if we are to succeed.

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Strengths and Weaknesses of the Undergraduate Program in Industrial Arts Teacher Preparation

Louis J. Bazzetta

Today much is being said and written about education, with the focus upon quality education for all. Accountability, management by objectives, behavioral objectives, planning, programming, and budgeting systems, recertification based upon performance objectives, individualization of instruction, increased costs of education, contracted instruction, and bonus plans are but a few items of concern to educators today. All these have implications for teacher preparation—both preservice and inservice. It is therefore timely and appropriate that we spend this brief time in discussing the quality of teacher preparation in industrial arts. It is a broad and complex topic and one that has many implications that cannot be adequately covered in the time allotted on this panel.

Educational Management Systems suggest the format in Figure 1 for making decisions.

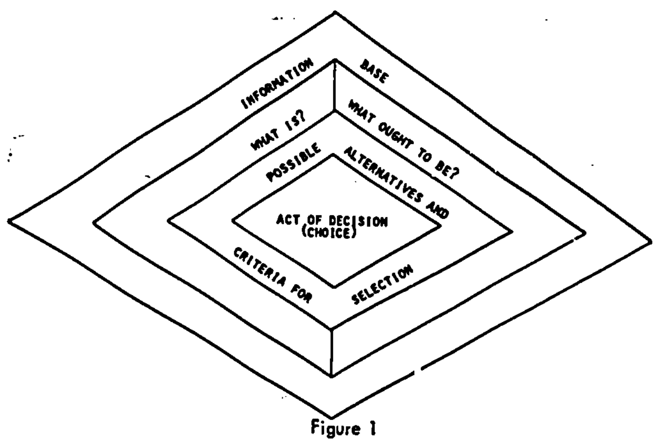

Figure 1

In order to obtain the "information base" and "what is," catalogues were obtained from more than 90 colleges and universities that grant a degree in industrial arts education. Their offerings and requirements were reviewed. Briefly, these are some of the findings: They require 125 to 142 units for a bachelor's degree. Twenty to as high as 48 units are required for a major. An extended major requires additional units up to 70. Most colleges follow the common area approach—woods, electricity-electronics, metals, drafting, etc.—while some follow a contemporary listing—construction, visual communications, transportation, etc. Most require a broad base in industrial arts and concentration in one or two specific areas. Some catalogs stated that individualized instruction is available to students, but in most cases this is not mentioned in the industrial arts area. However, some are conducting classes on "individualized instruction" basis.

In order to further obtain "information base" and "what is," supervisors and teachers were contacted. These are some of their comments: They are complimentary on the job being done by the colleges and universities in the industrial arts classes. However, some were critical of some of the education courses as being "theoretical." Student teaching experiences were praised.

New teachers are generally enthusiastic and desire to do a good job. Teachers are capable of designing appropriate learning experiences and evaluating student progress and effectiveness of teaching. Most teachers are skilled in the use of specialized instructional media. Most teachers are willing to work with all areas of the instructional program.

Although most supervisors and teachers complimented the job being done in preparing teachers of industrial arts, they also expressed some concerns, which include the following:

Knowledge on how to properly order instructional supplies and equipment and prepare a budget is vitally important and insufficient. There is a need for additional skills and knowledge about preventive maintenance. Strong training is needed in how to cope with increased class load usually caused by financial restraints; handle multiple activities in a general shop situation; and develop Learning Activity Packages to individualize instruction.

There is a need for improved communications with parents, students, and community, and ways of explaining the role of industrial arts. There is too much stress on educational verbiage—affective domain, psychomotor domain, and cognitive domain—that only educators understand and utilize the accepted A.S.K.—attitudes, skills, and knowledge. Reduce repetition by careful evaluation of student's experiences—formal and informal. Teacher training institutions should waive parts or all of course requirements if a student can meet the requirements on the basis of experiences or demonstrated competence. Students should have the right to challenge a course for credit. Closer cooperation with community colleges on transfer courses is needed. Opportunity should be provided for cadet teaching as an aide or as a para-professional before the senior year and also learn to work with them. Since teachers tend to teach as they are taught, more courses should be taught on individualized learning packages with definite performance objectives, and these should be known to the students. More experience is needed in writing behavioral objectives and performance based objectives. Just as new dimensions of performance patterns are being required by the teachers, so should these similar requirements of performance be requested of teacher educators. Some states are considering legislation for renewal of certificates based upon competency performance objectives. Prospective teachers should be prepared. Classes should specify clearly what it is that the student is to learn and also what methods are going to be used for assessment. Adapt degree programs to innovative programs (I.A.C.P., American Industry, etc.) and develop these programs to extend into the high school level. Define the role of industrial arts teachers in career education and the relationship of industrial arts to the 15 career clusters as defined by the U.S. Office of Education, and develop curriculum materials. Provide experiences in preparing P.P.B.S. (planning, programming, and budgeting systems). Understand the importance, need for, and procedures of accreditation of high schools so that they will be active, knowledgeable participants. Improve teaching methods and develop instructional materials for the handicapped and the disadvantaged students.

I am sure that some of you in the audience would agree with the findings; others might disagree, while some could make further additions. However, it is not enough for educators to acknowledge concerns. Action must result if progress is to be made.

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PRESENT AND PROJECTED POPULATION

OVER 25 YEARS OF AGE WITH FOUR OR MORE YEARS OF EDUCATION

(NUMBERS IN MILLIONS)

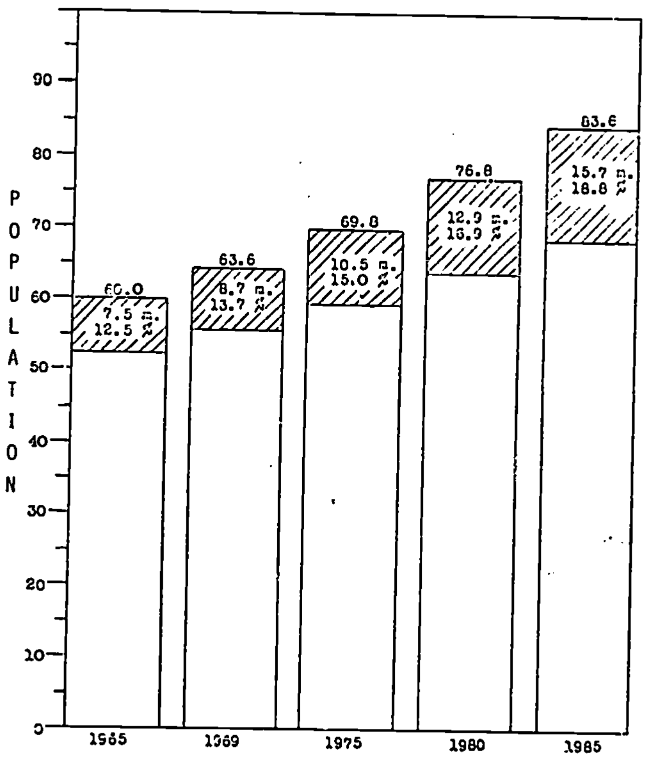

FIGURE 2

between the ages of 16 and 24, which would cover the majority of students in our college and university enrollments. These figures have been rounded off to allow easier assimilation of the data, but all of the figures are factual and represent our present population. If we look at the 16-year-old person in 1985, he is presently one year old and existing in today's society.[5]

The United States Department of Labor has supplied some additional data relating to educational achievement of the persons over 25 years of age. If we look at the number of people who have, or are projected to receive four or more years of college education, we can begin to narrow down the field to those people with whom we are supposedly concerned in this meeting (Figure 2). The most significant fact that seems to be apparent in this chart is the vast number of people who will have or will be working towards an advanced degree.[5] Our society in 1985 will be very highly educated and existing in a super-technological civilization. If we go at our present rate, the technological information of today will be more than doubled in 1985.

The global look with which we started can now be narrowed to our area of interest, and we may be able to see ourselves from a better vantage point. In 1969, with the 8.7 million people over age 25 with four or more years of college, we had approximately 757,000 people enrolled in either a Masters or Doctors degree program. The industrial arts candidates in 1969 totaled 3,151.[2] The data has been broken down in several categories, as indicated by Figure 3. In 1970, the total jumped to 816,000 and the industrial arts area expanded to 3,175.[3]

Masters Degree people make up approximately 85% of the total figure. These figures do not indicate the actual graduates, but only those people enrolled in a program. The data was compiled from 865 institutions of higher education in the United States and outlying areas.

Figure 3

MASTERS AND DOCTORS DEGREE CANDIDATES IN INDUSTRIAL ARTS

		1969	1970
Men - full time		609	688
- part time		2,477	2,435
Women - full time		28	12
- part time		37	40
	Total	3,151	3,175

All of the statistics presented should give you an opportunity to make some of your own projections in regard to the number of people we may be dealing with in the future. Let us now establish a rationale for advanced degrees in industrial arts with some technical competence, rather than filling all of the hourly degree requirements with "professional courses."

Dr. Richard Barrow, Associate Professor in the School of Technology at Indiana State University, has recently completed an institutional survey, with 54 schools of higher education returning his questionnaire. The survey was directed toward collecting information regarding staff members teaching technical subject matter.[1] When researching data for the survey, over 1600 people were identified as either full time or part time instructors in a technical field. Questions at this point are: Where did these people get their expertise? When did they have their last industrial contact in their technical area? These questions are important because I wonder if these people are teaching the same material they were teaching ten years ago, or have they up-dated to present today's industrial practices?

Most people realize that industrial arts today is taking on a slightly different look, and this dictates, to a certain extent, that our graduates receive a broad background which we think is necessary to teach today's innovative programs. I agree with this type of program up to a point, and then it is felt that there are some individuals who still need to have contact with the latest developments in their area of interest.

At this time, let me use an example of what I think is a typical graduate of today's industrial arts program. A friend of mine is presently seeking an industrial arts teaching position. He has a Ph.D. and has taught a few years in a secondary school system and then in a university. He does not have a specialized area, though he is a very knowledgeable individual in the area of "professional industrial arts subject matter." Every position that he has applied for, with an institution of higher education, resulted in the same questions being asked. "What is your strong area? What is your specialization?" When he answered, "Industrial arts is my specialization," he would get a response of, "I'm sorry but we need a specialist in manufacturing, metals, plastics, woods, servicing, etc., etc." Not everyone is going to teach the history, philosophy, and methods courses. There is a strong need for people to man the laboratory courses, no matter what method is used for dividing the subject matter.

We, as teachers of teachers, are selling one bill of goods to our students and then telling them later that they do not have the qualifications to accept a position on our staff. We had better take another look at the individual we are preparing to place out in the market place.

Let me explain a little further what I mean by giving the individual more technical competence. I am not suggesting that we add additional hours to a unit laboratory area and let this graduate student do individual research with the university's equipment. This is the last thing that I think should be done. What I am suggesting is that the individual have flexibility in his program which will allow him to attend such things as industrial schools, professional organization-sponsored classes or institutes, intensive industrial courses or workshops, and even credit to travel to visit industries which would add to his technical competence. He is not adding manipulative skill to his background, but he is getting up-to-the-minute information on what is going on in the industrial area of his choosing. Hopefully, he will carry on some of this activity after he finishes his degree, and this will keep him on the cutting edge of our technological society.

I was fortunate enough to have an extensive industrial background before a masters degree even came into my mind as a future objective. The first Experienced Teacher Fellowship Program at Wayne State University in 1967-68 selected me as a member of that program. The courses which we were able to take at Wayne State reflect the kind of program I am suggesting to you. Part of the course work was scheduled at such places as General Electric's Carboloy School, Bendix Industrial Control School, Vickers Hydraulics School, Miller Fluid Power School, and the Detroit Technical Institute. We realize that Detroit has an advantage, with many of these types of programs in close proximity. Other schools are not as fortunate in this area, but if you want to exert the effort you can find some very good sources which are not too far away.

Each day there are numerous times that I find myself using examples of things encountered during the industrial schools I attended. There have been many comments by students on course evaluations which indicated that the industrial examples used during lecture sessions made the courses more meaningful and interesting. Many of these illustrations would not have been possible without the opportunity of attending the industrial schools and visiting the local industries.

A survey was mentioned earlier in the presentation which Dr. Barrow at Indiana State University had undertaken recently. This survey was not directed towards information concerning a Masters Degree. There are some of us at I.S.U. who feel that this type of technical-oriented individual is so important to an institution of higher education that we are endeavoring to get permission to offer a Doctorate Degree in this area. This program would be for people who want to stay in a la...atory teaching position but must get a doctorate degree to compete in the educational arena of a college or university. I am sure all who have been involved on a college faculty understand the limitations an individual faces when he does not have a Doctorate Degree.

I would like to say as a parting comment that we should look closely at the candidates coming into our graduate programs and allow the student flexibility to prepare for his future. We need many kinds of people to teach in our industrial arts areas and a technically competent individual is as important as anyother. I feel that lately the university administrators have forgotten about the fellow who may be teaching in the laboratories of a university and are concerned with only preparing the "professional qualities" of the student. If the fellow in the lab is not up-to-date in his field, his professional career will be in jeopardy as the students slowly laugh him out of the classroom.

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Strengths and Weaknesses of the Master's Program

Wendell Roy

When considering the relative merits of any educational program, the evaluator is well advised to review the general characteristics and needs of the person receiving the program. In this instance, the Master's degree student is assumed to be a person of experience in some level of teaching or industry or is remaining at the degree-granting institution to obtain the advanced degree immediately after completing the Bachelor's degree. In any case, the general experiences of the B.S. degree are completed. The student has usually had sufficient time to realize his needs and accordingly has set his educational goals. Thus, he arrives at the advanced program with a definite idea of what he wants to obtain, what he must do to obtain the information, and what he can do with the additional education after it is obtained. The merit of an advanced degree program would then be to what degree the student can fulfill his educational needs and even go beyond his expectations.

The following paragraphs outline characteristics of the advanced programs which could denote strengths or weaknesses in meeting the objectives of the student.

FLEXIBILITY

The student must have a program which meets his needs. If the existing requirements for degrees are rigid and permit little if any experimentation, the student will possibly be thwarted in his aims. Certain institutions specify a series of courses which must be completed. After completing the courses, if an insufficient amount of time remains for personal goals, a definite weakness is presented. An ideal program would have the characteristic of specifying alternatives which permit flexibility in program construction for the student and still maintain the high level of professional requirements of the university, departmental faculty, and accreditation standards. All would be satisfied, the student has obtained that which he needs, and the institution is satisfied that the degree is of an advanced level.

APPLIED COURSES

An old problem of industrial arts is the reluctance of certain institutions to permit laboratory courses at the advanced degree level. Specified courses are "professional" in nature, and a continuous series of lectures follow. Attempts to explain the need for deep laboratory courses fell or have fallen on deaf ears in the higher councils in the university. The charge by industrial arts teachers and administrators is that the sciences enjoy applied or laboratory courses to the doctoral level. Why cannot we offer advanced laboratory courses at the Master's and Doctoral level? Ideally, applied courses could be obtained at the higher degree levels. These courses should be of sufficient content to be easily recognized as advanced courses by all who partake of the course and those who certify the offering. Fortunately, the trend to offer applied courses at the advanced degree level appears to be increasing.

LABORATORY FACILITIES

The laboratory facilities should be of such a nature as to permit a level of activities beyond the Bachelor's degree level. Experimentation and innovation should be characteristics of a Master's degree program. The equipment, supplies, and building design should allow the advanced level of attainment.

FACULTY

The faculty member is the deciding factor in insuring the success of the Master's degree program. From a position of strength in advanced programs, the faculty should be recognized as competent in their areas of specialization, alert to all innovations in the

Those of us who are in institutions which offer the doctoral degree with a major in industrial arts teacher education have a great deal of responsibility for the profession's growth and development. In the teacher education component of the profession, recipients of the doctor's degree hold the majority of leadership positions, and I believe that it could be demonstrated that leadership positions at the state level and in large city school systems are being filled increasingly by individuals who hold the doctor's degree.

I do not wish to be misunderstood on this point, so I should clearly say that some of the most significant contributions which have been made to our profession and which are currently being made are made by individuals who do not hold the doctor's degree. Clearly, these individuals, through experience, professional commitment, and their own professional development, have far exceeded the contributions made by many professionals who have had the advantages of advanced graduate study. Further, I would be remiss if I did not recognize the trend which places the recipient of the doctor's degree in increasing leadership roles within our profession. It is for this reason that those involved in the doctoral program in industrial arts education must recognize that they have an increasing professional responsibility. If this premise is accepted, then what are the ingredients or components which contribute to professional development at the doctoral level?

THE INSTITUTIONAL SETTING

One of the components or ingredients of an effective doctoral program is the total institutional setting in which the doctoral program is cast. An appropriate institutional setting for a doctoral program would imply an institution with sufficient size to permit the depth and variety of educational experiences which support the development of professionals with various kinds of sub-specialities related to the major field. This is to say that a strong department for a single academic major is not adequate for the total development of a professional in any given field of education.

RESOURCES

Since, by its very nature, a doctoral program does not have a large number of students, the institution must have sufficient resources to permit the relatively small number of doctoral students in industrial arts education to be integrated into other kinds of course experiences which are provided by the institution at large. This concept supports the idea that the total academic community has something of benefit for the professional in any given speciality. Especially in education, it is important that a professional be well grounded in the behavioral sciences, as well as the technology related to his discipline.

CLIMATE

Another dimension of this environment relates to the organization, as well as the attitude of the institutional decision makers regarding the field of study, such as industrial arts teacher education. If administrative support and academic status cannot be secured for the program, then the roadblocks to program development may be so great as to prevent the achievement of an effective doctoral program.

PERSONNEL

A second component or ingredient involves the personnel directly responsible for the doctoral program in the major. For an effective doctoral program to be developed, it is important that faculty be assembled who are highly qualified from the standpoint of both experience and specialized preparation. This is not only important for the direct contribution which is made to doctoral candidates, but it is also important for the kind of acceptance which is necessary for the program within the institution. While it is important for the faculty to be highly competent in terms of experience and training, it is also important that they be diversified in terms of their backgrounds. This is to say that doctoral programs must be national in scope rather than state or regional in nature. Therefore, the faculty must have as broad a perspective as possible.

One of the competencies essential to doctoral-level faculty members is a thorough understanding of research methodology and the application of statistical analysis to data. The development of research competencies, not only for use within the doctoral program, but in the future development of knowledge for the [illegible] of a doctoral program. Therefore, faculty members [illegible] must be thoroughly competent in this area.

Secondly, if one of the goals of a doctoral program is to prepare [illegible] teacher education personnel, it then becomes important that the faculty [illegible] be effective teachers with adequate classroom teaching experience. It is difficult [illegible] to be a teacher educator who has not functioned in the teaching role. I know of a few exceptions to this generalization, but they are truly that—exceptions.

Another factor related to faculty effectiveness is the competence and attitude of the faculty with regard to their professional involvement and participation through the sharing of their ideas with the profession through publications and speeches, as well as the assumption of leadership responsibilities in state, regional, and national professional organizations.

To summarize this doctoral program component, it should be pointed out that by the nature of doctoral study, as with most other kinds of educational programs, much that is developed by the learner is as a result of observation and application of the examples provided through the practices of the faculty members themselves. It seems illogical to expect a fully-developed professional to result from a doctoral program guided by personnel who are not themselves first-rate examples of professional development.

THE EDUCATIONAL PROGRAM

More than likely, when one is able to assemble a faculty such as previously described in an institution which has the organizational and other favorable environmental ingredients, we might be inclined to say that the other factors would take care of themselves. However, we would be remiss if we did not indicate that another essential ingredient of the doctoral program is the nature of the educational opportunities that are provided for the students and the strategies by which the students are brought into contact with the educational opportunities.

Formal Experience

First of all, this means the structuring of certain kinds of formal course experiences which are designed to assist the student to achieve certain career goals. Typically, the doctoral candidate in industrial arts teacher education prepares himself for a primary role as a teacher, researcher, administrator, or curriculum specialist. However, realistically, the professional develops other associated competencies which permit him to shift professional roles or to operate in settings in which he must carry out a variety of roles. Therefore, it is probably not wise for an institution to conceive of its program in such a narrow fashion that the doctoral graduate would not be able to function outside of a relatively narrow range of professional responsibilities, such as teacher education only, research only, administration and supervision only, etc.

In addition to formal course work, it is important that adequate learning experiences be provided to develop competencies related to scientific investigation and the associated competencies which relate to the analysis, synthesis, and evaluation of information and the communication of this information in an effective manner. Further, the program must encourage intellectual honesty and scholarly inquiry. It must assist a professional in his thirst for knowledge and truth; not that he become a negative skeptic, but that he become a scholar with a genuine concern for solving the problems which beset the society of which he is a part.

Unfortunately, it is true that many persons pursue the doctor's degree because this seems to be the only route for advancement that is open to individuals who seek positions in four-year colleges. Increasingly, it seems also to be a popular route for advancement to those who are in junior college and administrative positions at the local, state, and federal level. In my view, this should be the case only because the advanced doctoral study has provided an individual with additional competencies which earn him the right to be in a leadership position as a researcher and/or teacher and/or administrator and/or curriculum developer. It is indeed unfortunate that some institutions and individuals take the "union card" approach as a first consideration, with professional development perhaps occurring as an incidental matter.

To summarize this point, I would observe that professional development requires a well-planned structure for the educational development of an individual, but it also takes a commitment on the part of both the institutional faculty and the professional himself.

Development Strategies

The strategies by which the doctoral candidates gain their educational experiences is also an important consideration. For example, the research requirement can be looked upon as a hurdle to be scaled by the candidate. Or, instead, the research requirement can be looked upon as an important component wherein the professional gains research competencies which are to be utilized throughout his professional career. In this approach to the development of research competence, the candidate has more than a single research experience. He is assisted by the faculty and by his fellow doctoral candidates to develop meaningful research proposals, he has opportunities to develop research instrumentation which is adequately critiqued and piloted before application, and he has the benefit of a faculty advisory committee which not only approves the research, but assists the candidates in developing the research strategies and procedures essential to bring the research to a successful conclusion.

Yet another component of professional development through doctoral study is the provision for supervised professional experience. By this I do not mean merely part-time employment by the doctoral candidate, but instead I refer to supervised experiences of teaching, research, curriculum development, or involvement with other types of professional development projects through which the individual gains valuable experience in the application of more formally acquired knowledge and skill.

CONCLUSION

Through this discussion, I have not attempted to address all of the problems, all of the strengths, or all of the weaknesses of doctoral programs. I have, instead, elected to focus upon those factors which I believe are most essential to the development of effective professionals in industrial arts teacher education through doctoral study. If our chairman had assigned me a different topic, then I might have emphasized different components. However, these are the essential ingredients as I see them for professional development of personnel in industrial arts teacher education through the doctoral program.

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The Function of Today's Doctoral Programs

Thomas R. Baldwin

What is the function of today's doctoral programs? Is it as the Council of Graduate Schools in the United States (1968) would have us believe? "The Ph.D. program is designed to prepare a graduate for a lifetime of creative activity and research, often in association with a career in teaching at a university or college." This definition seems oblivious to the role of most doctoral graduates, as do many of the doctoral programs preparing these graduates.

I would suggest that the definition should read: The Ph.D. program is designed to prepare a graduate for a lifetime of creative activity and teaching, often in association with a career in research at a university or college (Council of Graduate Schools in the United States, 1968). This more accurately describes the positions filled by doctoral graduates upon completion of their programs.

The revision of this definition and the need for changes in the role of doctoral programs became evident in an examination of: what is now being done in doctoral programs to prepare their graduates for college teaching positions; what has been done in the past; and how the people involved in these programs as students and directors feel these programs might be made more beneficial to future candidates.

Department chairmen of departments offering the doctoral degree were asked to explain their programs.

Information indicated that many programs serve multiple functions, including preparing researchers and college teachers. A number of the responding departments obviously felt both teaching and research were concerns of their program, and that they were doing a job of preparing people for both of these positions. If these departments are doing the job they claim, how are these departments accomplishing this multiple task?

In search of this information, I asked the department chairmen how many of their programs included preparation in teaching methods and found that 75.3% included none. If there are no teaching methods included, the question continued, how then are these people to be prepared for the teaching function by your department? Teaching assistantships were a solution indicated by 97.8% of the departments, but these offered teaching opportunities to a limited number of teachers, and the supervision practices of these programs showed that most of them were of little value in preparing college teachers.

Was the department then relying on the individual's personal preparation in earlier programs to provide the expertise of a good teacher? To determine whether this might be true, 450 graduates were asked about their personal backgrounds and the preparation they received in their doctoral programs for the jobs they held upon graduation. Responses indicated that 73.1% of them secured their first job upon graduation from their doctoral program in teaching. When asked if they had any teaching experience before entering their doctoral program which might aid them in their college teaching, 31.5% indicated they had previous teaching experience, most having previously taught in elementary and secondary schools. When asked if this preparation provided any valuable carry-over to their college teaching, 43.6% said there was none, the others claiming varying degrees of value.

Asked if they received any preparation in their doctoral programs to prepare them to teach, 72.3% said their doctoral program included none. Only 22 of the 353 respondents had been involved in preparation for college teaching through an assistantship program, and they didn't all agree on the merit of this experience.

The question might be raised at this time about the function the doctoral degree actually serves. In questioning both department chairmen and graduates, over 80% said that the doctoral degree was considered a "union card" for college teachers. It was also an essential part of the requirements for the attainment of tenure for college faculty at many institutions. If this is the case, it seems to indicate that administrators responsible for hiring college teachers, or someone someplace, feel that the degree signifies some in-depth study of college teaching or a thorough knowledge of how a subject should be taught. If, as I have pointed out, it does not indicate an in-depth study of college teaching, it must be that the degree is an indication of subject matter competency. The graduates of these programs tended to disagree with this assumption also, as 30% of the graduates said they gained no subject competence in their concentration during their doctoral program, and another 33% felt it was only slightly enhanced.

What then is the function of the doctoral degree? It is time to closely examine this question and then re-orient our doctoral programs to provide the preparation needed by their graduates. If this preparation is, in fact, needed in the area of teacher preparation, it is time to provide constructive and worthwhile courses to meet this end. If it is to provide subject matter competency, then this should be done. If providing researchers is the job, then this needs to be done in a more organized and constructive fashion.

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Does Quantity Affect Quality?

Leon G. Devlin

Today all educational systems are being influenced by the increased cost of providing quality education. Doctoral programs are experiencing the effects as greatly if not more than undergraduate programs. The public is questioning the need for more doctorates in all fields now that there seems to be a surplus in some fields. In order to survive during this time of crisis, administrators are attempting to increase rather than stabilize or decrease enrollments. In many cases, this action has forced programs to continue operation in antiquated facilities geared for undergraduate curriculums. Funds are not available to increase the faculty appropriately, therefore individuals who are overloaded will be required to take on additional responsibilities.

What effects will the forementioned action have on the doctoral student? First of all, the variations and number of courses offered during a semester will be limited because "We only have so many people to teach." Therefore everyone must sign up for industrial education 666, "methods of creating chaos." Some may have already had the content of the course while working on the master's degree. The title was a little different, but nevertheless they need 12 hours, so they sign up. The professor assigned to teach the course has three other classes, so if a student is enrolled in any of those he will likely get a double, triple, or maybe even a quadruple dose of the same thing.

When the student begins to give some consideration to a research topic, being a typical graduate student, unsure of himself, he must try it out on his committee chairman. After spending considerable time in the library searching "the Dissertation Abstracts," current periodicals, and maybe even chasing a few rainbows, he is ready to present his ideas to the committee chairman. Several hours are spent attempting to arrange an office visit with the chairman, during which time some appointments were canceled because the chairman was called to the dean's office, had to go out of town, was called upon to substitute at someone else's committee meeting, or any of several other legitimate reasons, which all sound illegitimate to the individual involved. He finally arrives at the office door, wondering if it is all worth it.

Upon presenting the idea to his chairman, he may expect to hear, "That's a great idea: I'll call your committee members and arrange a meeting so you can get started." More than likely, though, he will hear, "I doubt if that is doctoral-level research, better try again," or "change that word to this word," or maybe even "I'll procrastinate over this for awhile; you arrange an appointment for next month." When the day finally arrives for the proposal meeting, the student is no longer wondering if it's all worth it. He now is positive that it isn't, but he has too much invested to quit at that stage. When the meeting is over and all of the word changes have been made, the proposal no longer resembles the original idea.

IS THE DOCTORATE A DETERRENT TO PROGRESS?

Most graduates of doctoral programs seek or return to employment in colleges or universities. There was a time when almost all doctoral graduates moved directly or advanced quickly into positions of administration such as chairman, coordinator, or head of a department. This is not the case today. New doctorates now spend most of their time in teaching.

Recently, the competition for positions has become quite severe. Those of you who had positions to fill last year or were seeking a position are well aware of this fact. Most departments would prefer to fill a vacancy with a doctorate holder, but due to economic pressure, many are forced to pass over those applicants with the degree and hire someone who has not started or completed the doctorate. Many junior or community college administrators are hesitant to hire a person with the doctorate because they see little need for the degree, or they can not afford the salary, or they just do not want to hire someone who may become a threat to their position.

For the most part, those who hold the doctorate continue to earn advancements in position, rank, and salary more quickly than those who do not have the degree. Some departments have become "doctor heavy"; in other words, their staffs are made up largely of persons with the doctorate. Advancement within a department such as this may be rather difficult, and an individual may need to change positions to get the advancement he desires. Although the doctorate holder may encounter some difficulties as the result of having the degree, the rewards reaped should far outnumber those of the non-degree person.

DO THE GRADUATES OF DOCTORAL PROGRAMS CONSIDER THE INSTITUTIONS TO BE FULLY QUALIFIED?

This question may be answered by one word. No! This may not be entirely fair to those institutions who offer the doctorate, therefore it is necessary to elaborate slightly. Ginther (1) conducted a study at the University of Missouri to determine in what way and to what extent doctoral programs were providing for the development of technical, research, teaching, and administration competencies. He reported that the time utilized in the development of specialized technical competencies appeared to be considerably less than the time that the respondents believed should be devoted to that area.

One of my fellow panelists, Dr. Moreland, conducted a study at Northern Colorado University to determine the effectiveness of that doctoral program in preparing the graduates for the positions they assumed (2). The doctoral advisors were described as being well qualified and competent, but their time for assisting students was too limited.

A study conducted at Texas A & M University (3) revealed that slightly over 50% of the industrial education doctoral graduates believed their doctoral programs to have been "generally relevant" to subsequent professional duties. Only 5.6% of the graduates indicated that their doctoral experiences had been "irrelevant" with respect to professional assignments. According to the graduates, the program description which could be most closely associated with that doctoral program was "flexible, allowing inter-disciplinary studies." Another description, which ranked third in the group of 16 descriptions, was "duplication of materials in several courses."

An effort to evaluate the faculty yielded neutral results in most cases. The standard deviations obtained approached normality, indicating a great deal of disagreement among the respondents. Most of the facilities at Texas A & M were considered to be excellent or adequate to support a doctoral program. Exceptions to this case were "laboratories for developing or conducting research and reproduction facilities."

WEAKNESSES VS. STRENGTHS

When a person contemplates whether he will or would again pursue the doctorate, many things must be considered. Over 80% of the doctoral graduates from Texas A & M indicated that they "would" again pursue the degree, whereas slightly over 8% reported they "would not" work on a doctorate if they had it to do over. Almost 50% were "very satisfied" with the degree in terms of their current earning power, prestige of the degree, etc., in return for the investment of time, effort, money, and sacrifices; 33% were "satisfied"; 12.5% were "undecided"; while only 2.8% were "dissatisfied."

It is rather interesting that in the study at Northern Colorado and the similar study at Texas A & M, the most valuable experience of the doctoral programs was the "association with other doctoral students." The Texas A & M graduates identified the need for more specialization in teaching, research, and administration in the fields of industrial arts, vocational industrial education, and technical education. The graduates of Northern Colorado believed that the philosophy of that program was somewhat limited to industrial arts.

Although the dissertation research does provide an opportunity for independent study, in most programs this is the only means the student has to explore an unfamiliar area. Pershing (4) recommended the inclusion of such courses as computer programing, data processing, conference procedures, and materials of industry into the industrial education curriculum rather than the traditional courses in philosophy and history of industrial education. These are areas in which today's doctoral graduates will most certainly become involved.

RETROSPECT

In my attempt to identify problems and weaknesses of doctoral programs, I did not intend to maliciously reflect inadequacies of specific institutions or doctoral programs. Institutions are concerned with the quality and effectiveness of their doctoral programs, as evidenced by the recent studies at the University of Northern Colorado and Texas A & M University. As the competition for the outstanding graduate students becomes more critical, other programs will find it necessary to examine their curriculums and requirements.

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Should Doctoral Programs Be Standardized?

Henry C. Moreland

When one mentions the term "standardize" with reference to educational programs, the reaction seems to include a certain amount of skepticism and reluctance. This is probably because we all immediately associate the term "standardize" with compromise, inflexibility, and loss of our opportunities to individualize educational experiences. As we consider standardization of doctoral programs in industrial education, we approach a similar dilemma. All of higher education, and particularly graduate study, is closely tied to centuries of tradition. Although industrial education is a relative newcomer to doctoral study, we have already attached ourselves to many of the age-old traditions, as well as established some traditions of our own. Therefore, if we are going to consider standardizing doctoral study in industrial education, we need first to examine closely our existing programs in light of present and future needs, with somewhat less concern for traditions.

Regardless of our desire to break with tradition, to implement change, or to standardize our programs, very realistically we realize that such endeavors are not arbitrary decisions made by department heads or graduate faculty. As John Feirer wrote in an I.A.V.E. editorial on doctoral programs:

> Too often the decisions are made by some higher authority—a dean or vice-president who lacks adequate knowledge of the needs of the field or who is not sympathetic to the problems of industrial education (1:23).

Therefore, we, as industrial educators, should study carefully all aspects of our doctoral programs with an eye for identifying those things within our control. We frequently find that entrance requirements, transfer credit, comprehensive examinations, and dissertation requirements are already specified for all doctoral programs within a particular institution. While these aspects of the program should be of vital concern to us, we should concentrate our attention on those aspects we have predominant control over, such as professional course requirements and their content, technical course offerings and their content, and the general scope and purpose of the educational experiences the student will be exposed to in the course of the degree.

Perhaps, before we concern ourselves with either standardizing or changing these aspects that we can control, we must first answer the question: "What is the purpose of the doctorate in industrial education?" Some say it should prepare a person to be a better teacher. Some feel it should prepare one to become an administrator. Others consider it preparation for research and writing. I am sure the majority of us feel that a person who has earned the doctorate should have a reasonable degree of competency in all of these areas. However, I think it appropriate for us to carefully examine these aspects through research that has been conducted, so that we might be able to weigh each and establish the needed priorities.

One study which sampled holders of the doctorate in industrial education throughout the nation reported that 54% of the individuals surveyed were primarily teachers, while an additional 30% reported their job entailed some degree of administrative responsibility. By combining these percentages, we can readily see that in excess of 80% of these people are either directly or indirectly associated with teaching students. This same study

Automation of office work and services, leading to displacement of 25% of current work force.

Education becoming a respectable leisure pastime.

Widespread use of sophisticated teaching machines.

Automatic libraries, looking up and reproducing copy.

Operation of a central data storage facility with wide access for general or specialized information retrieval.

Widespread use of automatic decision-making at management level for industrial and national planning.

Development of new synthetic materials for ultra-light construction.

Automated rapid transit.

1980-1990

Reformation of physical theory, eliminating confusion in quantum-relativity and simplifying particle theory.

Automated interpretation of medical symptoms.

Construction on a production line of computers with motivation by "education."

Widespread use of robot services, for refuse collection, as household slaves, as sewers inspectors, etc.

Widespread use of computers in tax collection with access to all business records—automatic single tax deductions.

Widespread and socially widely accepted use of non-narcotic drugs (other than alcohol) for the purpose of producing specific changes in personality characteristics.

Stimulated emission ("lasers") in X and Gamma ray region of the spectrum.

Economically useful exploitation of the ocean bottom through mining (other than off-shore oil drilling).

1990-2000

Availability of a machine which comprehends standard I.Q. tests and scores above 150 (where "comprehend" is to be interpreted behavioristically as the ability to respond to questions printed in English and possibly accompanied by diagrams).

Feasibility of limited weather control, in the sense of substantially affecting regional weather at acceptable cost.

Economic feasibility of commercial generation of synthetic protein for food.

2000

Three-day work week may be standard. In 1971, four firms per day rearrange their workweek schedule.

Labor force will be up 50% from 1971, which will increase the GNP to $3 trillion. At the same time, we will have 20 million aged, 150 million automobiles, and natural resources near depletion.

There will be 272 newly-planned communities in existence; 30% of our population growth will live in these communities.

All major industries will be controlled by computers.

Output of multinational corporations to exceed $4.5 trillion, as compared to $1 trillion in 1980.

(This list has been taken from The Futurist, 1969-1972)

EDUCATIONAL DEVELOPMENTS FORECAST – 1980
(Nation's Schools, May 1971)

1. Preschool and post-graduate phases of education will substantially expand. In addition, the relative amount of formal public education will decline as professional, technical, and educational recreation training increases.

2. In education technology, there will be a major shift in emphasis from hardware and associated software to that might be called behavioral technics.

3. Informal education will become increasingly popular as an alternative to formal education for both school-age youth and adults.

4. Education will be increasingly tied into recreation, particularly on vacations. A large number of educated, active, young and middle-aged people will seek to combine brief and intensive re-educational experiences with their vacations.

5. Technical and professional training will enjoy the largest absolute and percentage growth in investment, probably growing from the current level of approximately $18 billion in the U.S. to at least three times that figure by 1980. The forces driving this enormous expansion are: the accelerated rate of technical change requiring retraining in operations and applications; the increase in per capita productivity, yielding a greater surplus for reinvestment in human capital development; the increasing competitiveness of industries for high-quality, problem-solving personnel; and the increasing complexity and rate of social and technical change of the society as a whole, which will require much greater specialization and continuous upgrading of R & D, production, marketing, finance, legal, and general management activities.

6. The still-strong "credentials" barrier will be gradually eroded by increasing pressures for greater participation in education and educational decision-making by more non-professional community groups and individuals.

7. A new type of educator will emerge who is specifically interested in the continuous improvement, rather than the orderly maintenance of educational systems. This new educator will have elements of the entrepreneur, the systems analyst, the behaviorist, and the environmentalist.

8. The next decade will see a great disorder and fragmentation of education philosophies and doctrines analogous to the ideological and socio-economical, generational, and sexual polarizations of today.

This fragmentation may, hopefully, liberate the practical development of better instructional technics, materials, and educational environmental management from the rigidity imposed by past doctrines.

This exercise (a modification of the Delphi technique) would soon reveal inconsistencies in the programs of 1972. The radical critics of the day (Goodman, Friedenberg, Henry, McLuhan, etc.) all start with such a process as they question all aspects of American education. Gross (p. 17) has stated:

> The radical critics then look at the schools. What they find in the classroom is suppression, irrelevance, inhumanity, manipulation, and the systematic stultification of most of what is promising in children and youth.... Whereas some of them score the schools' failures to accomplish what they set out to do or what the needs of society require them to do, the most radical attack them for being entirely too successful in doing the wrong things . . . They would give not a cent to bolster education as it now proceeds, but would first require dismantlement of the entire enterprise and its reconstitution along basically different lines.

Those who are not familiar with futures research or those who disclaim techniques such as Delphi, will ask what can we learn from these predictions. Futures research does not merely concentrate on providing advice to those engaged in policy-making, but assists the policy maker in recognizing alternative futures, their consequences, and the most logical course to follow. Shane (p. 2) has listed five distinctions which show the difference between conventional planning and futures research. These are:

> 1. Futures-planning stresses future alternatives rather than linear projections; it is inherently value-directed and action-oriented. It concentrates on identifying consistencies and relationships among future probabilities and their probable impact as a result of policy decisions.
>
> 2. Futures-planning opens up more possibilities than conventional linear planning; it endeavors to point up possibilities that often are overlooked.

3. Conventional planning tends to be based on the assumption that a "good" tomorrow is simply a utopian version of the present with its problems removed. Futures research recognizes that we may need to anticipate quite different tomorrows with respect to resources, values, practices, and the attitudes which they reflect.

4. Futures research depends more on the rational study of anticipated developments—often long-range developments and their consequences—than on statistical analyses and projections. Conventional planning is often based on mathematical models. Futures research is less "mathematics model-based" and more "personal simulation-based".

5. In futures planning, the emphasis is not on the reform of the past but on creating a probabolistic environmental of alternative possibilities and consequences for careful study and choice.

CHILD OF THE FUTURE

Human life is still divided into three main periods: schooling, working, and retirement. However, a new society is developing which requires changes in our educational system. Janne (p. 81) has identified these major developments:

1. The schooling of youth will be less and less a matter of acquiring knowledge and information, but will be devoted to acquisition of methods, of thought, adaptive attitudes, critical reactions, and disciplines which teach children how to learn. This will mean not only the end of encyclopedism but the end of specialization as well. Contemporary activities will call for polyvalent humans who can adopt easily in a broad field.

2. The occupational period will be characterized by leisure rime for the absorption of culture, but this leisure will have to be more and more devoted to occupational adjustment and to keeping obreast of new knowledge. A system of permanent education must be set up.

3. Retirement at the age of 65 will be a thing of the past . . . each person will have some responsible activities as well as some studying and some time for leisure.

Educators must never lose sight of the fact that they are preparing citizens of the future. The first grader of 1972 will be 34 years old in the 21st century. This is approximately the age of the average industrial arts teacher of today. Are we judging children and curriculum patterns in terms of our view of the occupational period or in terms of their view in 1990? Dr. Pierce, a psychiatrist, when speaking about Sesame Street in 1971, reminded us of the axiom accepted by both futurists and mental health workers. Roughly stated, the axiom maintains that what causes someone to be mentally ill is the discrepancy he finds between childhood expectations and adult reality.... It is the responsibility of the teacher to let the child know as nearly as possible what life will be like—or could be like—when the child becomes an adult. There are things that a teacher can do to prepare a child so that he is in alignment with his future, yet flexible, adaptive, and imaginative enough to shape the future so that he and his fellows can live with more grandeur.

The child of the future will need to be at home with science and technology and understand the implications of all human activities that take place in the total system. He will need to understand the interconnectedness of all aspects of his culture and be able to consciously plan his future. From birth, the child has depended upon technology and will continue to do so until death. This does not imply a state of complete isolation from culture but rather an immersion within it. The child must learn to control this culture and alleviate the subordination of technology to those who do not understand its implications.

To many, the question that remains is, "Can we predict a breakthrough in technology, education, or anything else?" A breakthrough, according to Webster, is: "a sensational advance in scientific knowledge in which some baffling major problem is solved." Martino (p. 101) offers a less ambiguous definition. He says a breakthrough is "an advance in the level of performance of some class of devices or techniques, perhaps based on previously unutilized principles, which significantly transcends the limits of prior devices or techniques."

A strong case can be made for the inevitability of discovery. For example, many needs in our society mandate that certain discoveries must come about (e.g., cure for cancer). If it is true then, that certain discoveries are inevitable, then the forecaster need only ask whether it is time for the next step in his field. The history of technology reveals that many events could have been predicted by knowledgeable people. Einstein announced his theory of relativity in 1905. However, it was not until 1919 that the first artificially-induced nuclear reaction took place and 1942 before the first chain reaction was produced. Patents issued in 1930 and 1939 are recognized today as transistors. The only reason these were not developed further was the lack of information in chemistry which did not allow materials to be built of the required purity. But these patents could have served as a warning.

The object of forecasting is to look for signals which might be precursors of impending innovations. Unfortunately, these are diffuse, that is, found in many places and at different times. These signals are also buried by erroneous signals like the negative signals of the 1920's regarding the practicability of atomic energy. Therefore, the forecaster must take an active role in identifying breakthroughs that he is interested in. He must scan large amounts of material, identify implications, and confirm them. Once the researcher has these confirmed, he must raise the question of, "What do we do with this data?" And this is precisely the position from which we must move with the direction of industrial arts in a technetronic age.

FUTURE OF INDUSTRIAL ARTS

Industrial arts programs of the past, like almost all curriculum areas, have mass-produced students who turn out to be a commodity, replaceable and expendable. The new student (the child of the future) must be unique, aware of his culture, capable of making rational decisions within a technological environment, and unique as a person. This will mandate a whole new structure of educational philosophy, content, and method. The fragmentation of disciplines will no longer suffice because they merely perpetuate the fragmentation of the students' perspective of the "real" world. Programs will need to become multi-disciplinary, based upon the present and the best predictions of the future that we can develop and allow for student participation. Maybe it is time that educators simply "get out of the way" and let students show them what they mean by relevance. The writer is convinced that the child of the future has learned an axiom that we adults should consider, and that is: It is people that change technology, not some invisible, indestructible monster that it has been made out to be.

With these ideas in mind, please allow the writer to do some predicting of his own. These predictions are written in two groups in order to separate two distinct possibilities:

Assuming the industrial arts profession, especially teacher education institutions, continue to disregard the technical and socio-cultural data available about our technological culture:

<u>1975</u>
High school will begin to drop industrial arts from the curriculum.

<u>1980</u>
Teacher education institutions will begin to drop industrial arts from the university curriculum due to diminishing numbers choosing such a major.

<u>1985</u>
Industrial arts will no longer be required at the junior high level in most states.

<u>1990</u>
Industrial arts will not be required by any state in the country and will exist only as leisure time activities for all age levels.

Assuming the industrial arts profession is willing to address itself consciously and diligently to the data available about our technological culture and to make the changes necessary for a relevant curriculum:

<u>1973</u>
The AIAA will develop a committee for the study of the future and begin recommending changes needed for the study of technology.

<u>1975</u>
The study of industry, as a discipline base, will be rapidly declining in favor of the study of technology as a discipline base.

long as it appears that the "old wineskin" will hold our "new wine!" The label must stand the test of wide acceptance and the test of definition with unvarying meanings if truly it will be useful and will make a significant difference.

Career education is "on-stage," front and center; but looking beyond, there seems to be yet another force of great potential for redirecting industrial arts and industrial arts teacher education. The label of that force is "The Third Industrial Revolution." It is important that we examine the concepts of the third industrial revolution to understand its potential influence upon career education, as well as upon industrial arts and industrial arts teacher education.

THE THIRD INDUSTRIAL REVOLUTION

The first industrial revolution followed the invention of the steam engine; the consequences that followed its use include the development of the factory enterprise and the great shift in population from the countryside to the emerging industrial cities.

The second industrial revolution may be characterized by the concept of mass production and the continuing developments toward automation. More and more of man's work became unskilled, repetitive, and "button pushing." A major consequence of the second industrial revolution was the creation of our affluent society.

The third industrial revolution is developing as a reaction to the dehumanizing effects of fragmented work and meaningless work environments. Industry is again providing the leadership, as it did in the earlier industrial revolutions. Bell Telephone is a leader in this area and a description of early experimentation was reported by Marco Gilliam[3] in the Bell Telephone Magazine. Harold Rush[7] wrote case studies of efforts of other industries, and these were summarized in The Conference Board, Inc. publication.

The publication includes reports of case studies by Arapahoe Chemicals, Boulder Colorado; Texas Instruments, Inc., Dallas, Texas; U.S. Internal Revenue Service; Weyerhauser Co., Tacoma, Washington; Monsanto Co., St. Louis, Mo.; and PPG Industries of Lexington, N.C. Concepts of the third industrial revolution may be expressed in many ways, but the central concern is the recognition of man's creative nature as well as his inheritorship. Some descriptive definitions of explanations are as follows: The redesign of the work environment to maximize human fulfillment; redesign of the system to meet man's needs rather than training and rewarding man to meet the technological requirements; designing the job to develop the man rather than training the man to fit the job; design for mutual development: man develops the job, the job develops man. Experimentation by individuals and by industries were also identified by labels, including Bell Telephone Company's "Work Itself" and Weyerhauser Company's the "I Am" Plan. Some of the industrial experiments are based upon Frederick Herzberg's[4] "Motivation-Hygiene," and some upon Douglas McGregor's[5] "Theory Y."

The disturbances and turmoil of recent years in many of our societal institutions are evidence of man's struggle to achieve the full potential of his humanness. None of our societal institutions can escape this struggle. It seems that people rather suddenly have greater awareness and concern for who they are and for their potential for being. They are often described as less easily controlled, less dependent, less submissive, and less passive. The carrot-and-stick formulas for motivation have lost effectiveness. People must have challenges and meaning for self-fulfillment. The third industrial revolution is progressing; jobs and work environments are being redesigned toward creation of meaningful and satisfying work, in recognition of man's basic creative nature. Industrial arts would do well if it is redirected into this humanized reorientation, where it might exercise a positive force in the third industrial revolution. Humanizing the workplace is a relatively new frontier and a major societal need. We should move in this area with industry and prevent the practice-lag from developing.

INTERPRETING THE SIGNALS AND LABELS

Our signals and labels are too often subject to variable interpretations, and sometimes the "bandwagon" effect is created through successful merchandising rather than through critical analysis and real understanding. Research reports can assist with our critical analysis, and the Review and Synthesis of Research on Occupational Adaptability[8] only recently published by ERIC Clearinghouse on Vocational and Technical Education is timely for this purpose. Consider the following signals and labels:

Career Education

The "bandwagon" effect has created great hope and broad attraction. The process of refining and making the definition more specific will challenge its power as a unifying label with wide acceptance. If its interpretation justifies "business-as-usual" for the diverse areas and programs, failures can be expected. We should give our best efforts and have patience while developing and refining definitions. It is important that we preserve the early advantages of the attractive new label.

Cluster Concepts

Merchandising efforts and research investments seem to have created a "halo" of respectability for the cluster label, even though research is unable to identify any significant difference in favor of the cluster programs. In fact, the research findings suggest that we may be in error with ideas we often take for granted regarding transfer of meaning and general educational values. Years ago, similar strategies were criticized as preparing the "jack of all trades and master of none," and the criticism seems valid in light of recent research findings.

Douglas Sjogren[8] reviewed and synthesized the research on occupational adaptability. Much of the research involved cluster approaches, and none of the findings to date revealed any significant advantages for cluster concepts. Sjogren quoted a study by Morrison which pointed out the unlikeliness that a curriculum based on a cluster could be identifiably different from a curriculum for any one job in the cluster, since by definition, the curriculum must contain the elements required by that job.

Sjogren's summary included an interesting reference to the work of Ausubel et al., who carried out experiments to demonstrate that learning and retention is facilitated if the learner gained a clear set of "anchoring ideas." The example given was that thorough knowledge of Christianity provides the "anchoring ideas" useful to facilitate learning and understanding of other religions, such as Buddhism. The generalized finding that adaptability of an individual to different situations can be facilitated by an available repertoire of "anchoring ideas" should shake our faith in some of our practices and assumptions. Further support for the importance of the "anchoring ideas" concept may be found in James W. Altman's[1] findings that the most effective generalizations of electronic maintenance ability for multiple systems occurs when priority is given to training for skilled level on one system before trying to develop generalized technicians at the outset. This is further support for the often-heard generalization that what is studied and learned is not nearly so important as a record of excellence in something.

The possibilities are evident that general education values, transfer of meaning, and adaptability are really achieved from depth study, and that skill and technical knowledge proficiency can contribute to those goals rather than detract from them. There seems to be an underlying relatedness of all things as they converge into human values in depth study, particularly if the environment for depth study is real enough to provide confrontations with human values.

Problem Solving

As a label, problem solving enjoys wide acceptance, but definitions are so broad and variable that practice can become misleading. When problems are predetermined and packaged for student verification rather than for genuine investigation and inquiry, the strategy may easily degenerate into dogma.

Behavioral Objectives (Performance-Based Curriculum)

Educators are investing heavily in time and money for performance-based curriculum materials which are keyed to behavioral objectives. The label is becoming widely accepted and possibly even blindly accepted. Like problem solving, behavioral objectives can be misleading and deserve careful scrutiny.

If the third industrial revolution has the impact as hypothesized, the instructional materials now in production will rapidly become obsolete. Instructional materials generally are designed to prepare the individual to fit the existing job, without concern for altering the job to fit the man. The third industrial revolution is challenging the dehumanizing elements in industrial jobs which have been preserved through training based upon scientific job analysis. We must begin to ask what are the requirements for man's fulfillment through work, rather than what are the requirements demanded by the job. We must know what it means to be human, what it means to be dehumanizing, and what it means to experience human fulfillment to adequately evaluate behavioral objectives and performance-based curriculums.

Mass Production

Many efforts for innovation and change incorporate mass production strategies. Mass production is at least as old as the model-T Ford and certainly incorporates many dehumanizing elements which are under attack by the third industrial revolution. Mass production may be the point-of-departure, but dynamic development toward more humanizing systems must develop.

Guidance and Counseling

Guidance and counseling seem as acceptable as "motherhood and apple pie." We seek more and more of it, but research has evidently raised some questions that may be shocking to us. Psychologist John Rothney[6] presented his findings from a 20-year follow-up study of high school students to the 9000 members of the APGA convention last April. Looking back 20 years, students who had been lavished with "the best counseling we could give," compared to those receiving no organized counseling, revealed no differences in career choice, satisfaction, confidence, or value placed on counseling. A member of the audience was credited with the comment: "At least he didn't show that we harmed them!"

We are reluctant to use the research findings, possibly because research is so new to us. We have paid for the research; some findings are now available, and we should begin to take the findings more seriously.

Ergonomics

This new label should not pass unnoticed by industrial arts educators. If the third industrial revolution has the impact as anticipated, the term could come into common usage. Its composition and effect in usage tends to generate a halo of respectability and thus could enter the competition as a new name for industrial arts in the framework of career education. The term was developed from the Greek word ergon, meaning work, and was defined by the 1961 Geneva International Labor Review as "The Scientific Approach to Making Work Human." Ergonomics could greatly facilitate "The Third Industrial Revolution."

WHAT DIRECTION FOR INDUSTRIAL ARTS AND INDUSTRIAL ARTS TEACHER EDUCATION?

Industrial arts would do well to build momentum for redirection under the influence of the third industrial revolution. The critical analysis of our popular labels was offered as warning against misuse, but they are not to be discarded unthoughtfully. Some specific areas for attention and redirection are as follows:

Less emphasis on the following Dehumanizing Strategies:	More emphasis on the following Humanizing Strategies:
scientifically-analyzed job requirements	the nature of man and his fulfillment through work
authoritarian supervision to hold technical requirements	individual responsibility and decision making
isolated skill training to technical requirements	skills developed in dynamic functioning context (evaluation and rewards are automatic)
scientifically-prescribed procedures	individual participation in decisions and planning of procedures
behavioral objective which defined predetermined technical requirement	behavioral objective which defines mutual growth and development of the man and the job
concern for breadth of exploratory experiences (gaining many isolated experiences of little depth)	concern for depth experience in total enterprise context (gaining anchoring ideas in environment that provides broad peripheral vision)
achieving verification of knowledge and skill requirements to instructor's satisfaction or approval	employing creative talents to change knowledge and skill requirements to satisfaction of self and others
instructional materials and environment designed to evoke verification	real responsibility in junior or analogue industry creating spin-offs and change

covering and putting across information and content	functioning in context as productive example
use of the labels: teacher-student	real roles in enterprise
adjusting man to the system	redesign of systems to meet man's needs
maxi-industries with centralized control	mini-industries with decentralized control
success in terms of economic values	success in terms of human values

The critical examination attempted to challenge some of our readily-accepted assumptions and practices, but it also attempted to raise some challenging possibilities and hypotheses to be tested.

If human fulfillment becomes our primary objective in the work place and in education, we may find that many of our old problems in teaching and learning readily dissipate through the design of more efficient teaching and learning strategies. When human values become central in the total enterprise system, then liberalization and specialization can be integrated as elements of the same process. Great artists and great musicians achieved specialization, yet captured the values we expect from general education and liberalization. It is time for us to seriously face the fact that individuals are different; that creative potential is a function of those differences; and that pursuit of specialized talent differential leads to human fulfillment, adaptability, and liberalization, which are the objectives of the third industrial revolution.

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A View of Technical Components in Teacher Education

Jerry Streichler

Please consider this presentation an idea and reaction session. At Bowling Green State University, we have been doing some things which we believe are exciting to faculty and to students. We think most of these ideas will produce a better product—a fine teacher of industrial arts.

We would like to share these ideas with you and welcome your criticisms and questions.

To allay apprehensions—the kind I always get when I hear introductions to topics of this sort, let me tell you what this session is not going to be and what it is intended to be:

We are not going to spend time on a lengthy discourse propounding a rationale or foundational philosophy. We hope, nevertheless, that after viewing and hearing about what we do, you will perceive our rationale—the bases for action.

We expect that whatever image is formulated will be an eclectic one, because we confess to having borrowed heavily from the experiences of our colleagues—most of those rationales and philosophies you have heard and to which we have added some new or different "twists."

We are not going to talk methods, or instructional technology, or how to teach people to teach.

Instructional technology is regarded as a distinct and different component of teacher preparation programs. We do not lose sight of the fact, however, that well organized, well-presented, exciting, and challenging presentations and interactions by the professor in technical courses serve as excellent behavior models for the teacher in preparation!

Based on personal experience of several faculty "gut" level (intuitive) feelings, substantial analysis of trends in content, student interests, improving faculty competencies, and higher expectation of faculty and other resource utilization, the following eight statements have been accepted as guideposts or hypotheses which are being tested in program development and implementation in the Department of Industrial Education and Technology at Bowling Green State University.

There is an identifiable and organizable body of knowledge of technology as it is manifested in industry. Academic departments in colleges and universities whose history is rooted in industrial arts education have a vital obligation to develop that content to its highest level of sophistication.

The body of content may be broader than that which may appropriately be expected to evolve from an academic base in industrial arts. Consequently, individual departments may need to add services usually associated with other academic areas; or, as in the case at Bowling Green State University, the department may choose to upgrade and properly expand its technical base and seek support from strong existing academic departments within the university.

Such action seems reasonable since the areas of technical content retained by the department are so vast that it would be inefficient to attempt to add courses like industrial management, industrial psychology, personnel, etc., courses which are accepted as part of the technical content component of industrial arts teacher education—when they are effectively taught on the campus by others.

In spite of this, faculty within the department are obligated to draw upon and often integrate such subject fields as noted above in their courses—particularly those which attempt to synthesize industrial technology.

Technical content in industrial arts teacher education courses can not and must not be imparted through or be a replication of those things which students in the public schools do. Little justification is seen in having sophisticated, intelligent university students engaged in elementary; junior high, and senior high activities. This may be viewed as a rather harsh statement. Consider—those of you who are products of traditional teacher education programs and those of you who are administering or teaching in teacher education programs in industrial areas—Which activities did you experience as a student on the college level that were in truth elementary, junior high, or high-school activities? How much of the content that you were asked to master, how much of the manipulation you were asked to do, how much of the attitudes that were fostered on the college or university level were identical to those things that you knew you would be expected to do and foster on the elementary, junior high, or high-school level? How many teacher educators perpetuate this kind of thing on the university level, use junior and senior high school level text books, replicate junior and senior high school activities, and pass it off as appropriate university-level content in industrial technology?

Technical content for industrial arts teacher preparation—intellectualized and systematically taught—is appropriate also to students with career and educational goals different from those who wish to teach.

Technical content so ordered will encourage the development of an eclectic faculty comprised, perhaps, of teacher educators, engineers, and industrial technologists. Such a group can better communicate and create challenging activities and content configurations for all students who can benefit from industrial technology studies.

Consequently, the technical content is relevant to students preparing to teach industrial arts or industrial subjects in vocational and post high school institutions, as well as those who wish to work in industry as technical problem-solvers or those who wish to

THE TECHNICAL COMPONENT OF INDUSTRIAL ARTS TEACHER EDUCATION CONTENT

A. WITHIN A DEPARTMENT

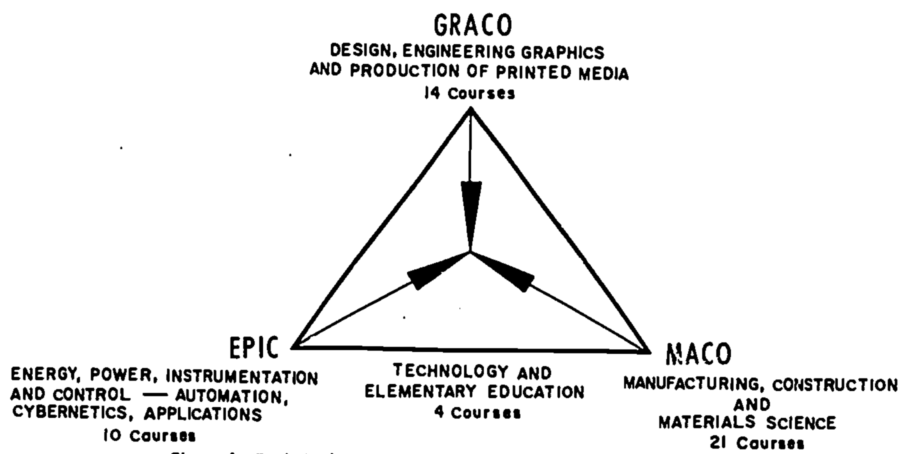

Figure 1. Technical Components Within a Department-Interfaced (IET-Bowling Green State University)

pursue such studies for liberal education purposes.

Permit me briefly to establish the framework in which we are "testing" these guideposts or hypotheses.

First, you may wish to consider how we have subdivided industrial technology. Figure 1 provides a graphic representation of the department's technical content responsibilities. Three acronyms define the majority of the content. MACO refers to courses in manufacturing and construction and materials science; GRACO, graphic communications, includes design and engineering graphics and production of printed media; and EPIC refers to energy, power, instrumentation, and control. Each of these areas are explained in detail by our presentors. Please note, however, that the triangle in the illustration emphasizes interfaces and overlaps among the areas.

Another way to look at the interrelationship of content areas is to note the kinds of courses which contribute directly to industrial technology content or are necessary basic areas of knowledge required for effective study and functioning in industrial technology and which are offered in other university agencies. Figure 2 displays the interfaces of specific department content and examples of courses provided by other colleges within the university.

Finally, Figure 3 exemplifies the totality of industrial technology content. The observer will note the addition here of 3 to 4 quarters of industrial internship (cooperative education), a strongly recommended option for students which, when practiced, makes the content meaningful and relevant to the student as he progresses through his four years with us.

A final word about the presentation of the content within the department's domain. We have conceived a freshman-sophomore core of what may be considered conceptual GRACO, MACO, and EPIC. This is followed by specialized courses—in-depth study opportunities during the junior and senior year. We are considering an alternative to this sequence which includes:

1. A Conceptual Core—Freshman Year.
2. An Analysis Sequence—Sophomore & Junior Years—in which the technical elements are studied in depth and specialized modes.
3. A Synthesis Experience—Senior Year—in which the student functions within the world of industrial technology, applying his specific content strengths in interface with

THE TECHNICAL COMPONENT OF INDUSTRIAL ARTS TEACHER EDUCATION CONTENT

B. CONTENT FROM OTHER ACADEMIC AGENCIES

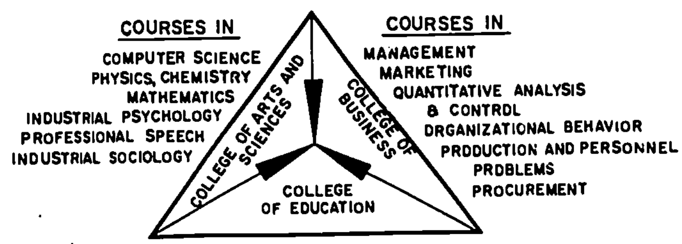

Figure 2. Examples of Relevant Industrial Technology Courses provided outside the department—and a representation of Department and College interfaces.
(IET-Bowling Green State University)

THE TECHNICAL COMPONENT OF INDUSTRIAL ARTS TEACHER EDUCATION CONTENT

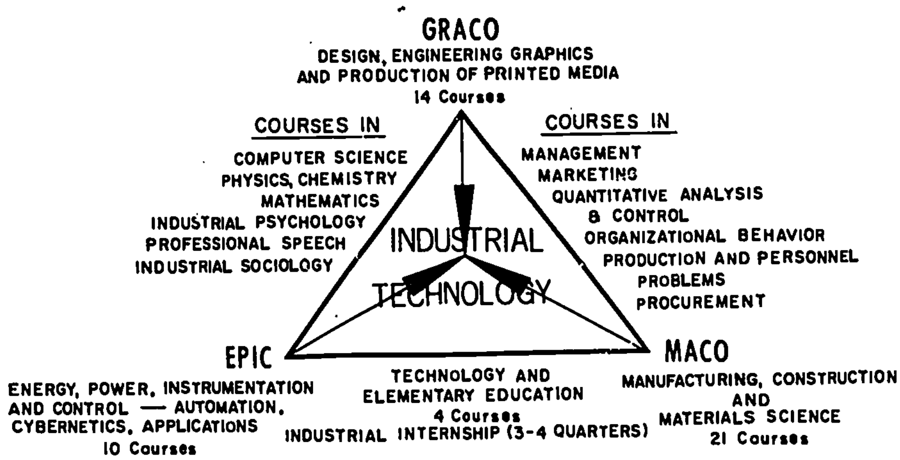

Figure 3. Total industrial technology content (partial representation).
(IET-Bowling Green State University)

the strengths of other students as they study and solve major complex problems in industrial technology.

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What You See Is What You Get

Dempsey E. Reid

This paper is a summary and conclusions drawn from observations during a six-month sabbatical leave last spring (1971). The sabbatical leave was approved with a proposal to visit industrial arts—education—technical programs in elementary, junior high, senior high, vocation-trade schools, junior colleges, senior universities, and technical colleges. Preliminary planning included reviews of catalogs, brochures, and acquiring information from speeches and published reports of what is being done in the industrial programs throughout the Midwest, Southwest, Far West, and North Central states. Visitations were planned along a 11,000-mile trip that would include some 45 institutions that spanned the spectrum of industrial programs.

COURSE DESCRIPTIONS

One early observation was that what you read and hear is not "what you get" when you visit and see what is actually happening. Another early observation was that the colleges and universities were the worst offenders, with the elementary and high schools being the most accurate in their program descriptions. Perhaps the influence of parental closeness to public schools and the aloofness of the universities to outside pressures is a contributing factor to this situation.

The public schools are more closely scrutinized and held accountable by each entering class to do what they say they are doing, but the universities seem to be immune and object to outside reviews and advisory groups. The public school brochures distributed to the new students and parents accurately describe programs, course content, and facilities; the higher the educational level, the more the descriptions become inaccurate and colored. A high school "Woodworking 1" course describes it as "The care and use of hand tools and basic machines in the construction of appropriate projects. An introduction to the woodworking industries." A university "Wood Technology 1" catalog description reads: "The science of basic wood technology, including technical skills, creative design, resources, materials, personnel management, and surface finishes. Outside speakers, audio-visuals, and field trips will be utilized."

A visit to the high school class reveals they are constructing wood projects using hand tools and machines—just what they said they were going to do. A study of the course outline indicates lectures and demonstrations describing processes and the wood industries. The students, upon questioning, verified that these lecture sessions including films, outside speakers, field trips, and reports have offered them learning experiences in understanding the wood industries. A visit to the university classes reveals they are following the same activities as the high school classes and in some cases with less emphasis, especially in field trips and outside speakers. Interviews with the college students indicated that they are experiencing the same educational activities as the high school students—but compare the published course descriptions!

MISLEADING UNIVERSITY CATALOGS

Numerous interviews with high school seniors over the past 25 years leads the writer to the conclusion that university catalogs do not "tell it like it is" and are not understood and properly interpreted by the students. If a major purpose of the university catalog is to describe the programs to the entering freshmen, then why not be concise, clear, and truthful in the course descriptions? Most of us include the term "wood technology" some place in the catalog description, but fail to explain what it includes. Ask the average high school student what he thinks "wood technology" includes and you receive a multitude of answers; very few of them really understand what will be offered in the course. And if we do properly describe it in the catalog, do we teach what we describe? Examples such as this can be given for drafting (engineering drawing), metals, electronics, and others.

Another misrepresentation is in our laboratory descriptions and pictures. We publish a picture of a power mechanics activity showing the student using electronic testing instruments, motor analysis devices, and adequate tools available to do the job. The caption under the picture reads, "a typical laboratory facility that offers meaningful learning experiences with modern equipment." A visit to the laboratory reveals 24-30 students in class, one ten-year-old Marquette analyzer, two or three engines, and hand tools available for only 4-5 students. We are not being honest in our competition to recruit students.

The catalog explains how easy it is for the junior college student to transfer credits and progress in the university program, but when he transfers he faces restrictions, prerequisites, and special limitations that he never suspected existed. The catalog did not fully explain these details. The university catalog lists student loans, scholarships, and work programs available, and indicates everyone who desires assistance can obtain it—yet when the student makes application—sorry. Interviews with many students show these two items to be most misleading in many catalogs.

Another misleading statement is: "Several options and individualized programs are available to fit the student individual needs." Read the graduation requirements, and you find 40% required basic curriculum, 15% required education courses, 15% required departmental core courses, leaving 30% for the major requirements, and these include "directed electives." Why not "tell it like it is" and let the student "see" what the university requirements actually are.

THE STUDENTS GET WHAT THEY SEE

The misleading catalog descriptions are only part of the misconceptions we present to the students. Here are some others that are frequently reported by students.

1. Not following course outlines. For example: a unit in plastic vacuum forming is listed, but either not enough time, too many students involved, or the machine is broken so the student doesn't receive the experience that he was expecting.

2. Use and availability of special equipment. Example: the impressive brochures said it was a typical classroom activity to use this equipment, but in reality it is available only to graduate students, or the class is not yet ready to use the $15,000 machine. We require them to hand plane and hand sand the table top while the surfacer and drum sander are standing idle or the surfacer knives are dull. The brochures we print say that the students have adequate supplies and facilities to do "experimentation and creative research." The student loses faith in us when he learns there is no small engine dynameter to check his results in redesigning a two-cycle engine. We know our facility limitations—let the students also know before they plan an activity that cannot be completed.

4. Individual advising and planning students' special needs—many students report they plan their own program and the adviser's secretary rubber-stamps approval. This is difficult to explain when the student finds out he cannot graduate on schedule because of some requirement he didn't know about. Also, where are the provisions for individual differences we talk about? How many of us actually provide for any individual differences other than extreme physical or mental differences?

5. Providing for creativity and encouraging problem solving—we advertise and list these as the objectives of the course, but provide no means to accomplish them. The exercises and experiences are assigned in lock-step procedure. No problems are presented that need to be solved, and the examinations test rote memorization and not application of learning or problem solving.

If the above practices are followed in our teaching, this is what the students see, not what we say they will get. When the students come to class and see the instructor sitting at the desk reading Popular Science, not guiding in the laboratory, not following the course outline, and not presenting challenges, he soon loses his program. When the teacher announces that "for the next four weeks you are free to do what you want," the results are often disastrous. Those of us in teacher education who follow these practices will be producing teachers who do the same, and next year we will wonder why the freshmen class is such a problem.

EXAGGERATING REPORTING

Many of us are guilty of coloring, exaggerating, and describing future hopes rather than actual happenings when we submit budget requests and curriculum revisions. We use every adjective and superlative statement we can conjure to impress the administration. They grant us our requests, then next year expect great new things; when they pay us the annual visit and find we are not doing what we said we were doing last year, let alone the new activities, we are in capital "T" trouble! How can we expect additional money next year?

The vacancy notices we mail in recruitment of new teachers are often just as misleading. We describe the pleasant surroundings, excellent working conditions, progressive programs, high salaries, small classes, research opportunities, etc., etc. But when you hire and the new teacher comes to work, you start with the excuses.

We request new courses and curriculum revisions to make our courses more relevant to today's needs. What new courses are really needed—why not change the present ones? If we are granted new course titles but continue using the old course outlines, following the same construction practices and giving the same lectures, we can and should be severely criticized. The teacher education students are being deprived of the best opportunities because of the reluctance of the professor to change.

What image does your showcase convey to the public? If we want the public and administration to believe that we do more than construct projects, we should also put it on display. Do we show pictures of industrial procedures, display student-written reports, planning procedures, and the research that is required in many of our activities? If bird houses and radio kits are all we display, they get what they see. We should transmit the whole story of our program in displays.

The industrial arts professor usually lists community services as part of his activities in his request for released time or fewer classes. Yet, do we really do it on a regular basis, or only once a year give a speech to the women's Wednesday afternoon study group? And when we do give speeches, do we tell the truth? If we say we draw architectural plans but never have a home constructed from them, how long before the public gets wise?

GENERAL APPEARANCES

Finally, we get what we see in student and laboratory appearances. If we promote and allow dress fashions and personal appearance that create an impression of disorganization, dirt, carelessness, and lack of concern, then this is what we will get in the final results. In teacher education, it is most important that we create an atmosphere and encourage personal appearance that will motivate organization, cleanliness, and cooperation. If we do not enforce organization, cleanliness, and laboratory management, the students will carry this attitude with them when they begin teaching.

During the visitations last year, the quality of the program was obvious when you first entered the laboratory. Organized and orderly laboratories indicated the better programs; the disorderly laboratory was typical of the weak programs. It was also common to hear the comment, "Please excuse the mess, but the janitorial service is terrible, and we haven't had time to clean up." When you observe a year's accumulation of dust, dirt, and scraps in the project storage room and in bench drawers, the janitors cannot be blamed.

In conclusion—"What you see is what you get;" words, speeches, printed brochures, catalogs, and scholarly course outlines mean nothing when it is obvious it is not what the students get when they enroll in the program. We should be held accountable for what we say in relation to what we do.

Dr. Reid is a member of the faculty and Department Chairman for Industrial Education and Technology at Western Illinois University, Macomb, Illinois.

Preparing the Undergraduate Industrial Arts Teacher for the Future

J. B. Morgan

Time and selectivity are two major problems with which we must cope. We have proven that we can provide teachers for the traditional industrial arts program. The future industrial arts teacher must be prepared in the following areas to meet the challenges of our ever-changing society: philosophy; manipulative skills; related information instructional material; methodology; psychology of learning; and general education. If we are successful in our efforts, we should develop a beginning teacher who possesses poise, confidence, and teaching ability.

PHILOSOPHY

I shall always remember one of Dr. Kenneth Perry's most famous quotes, "This I Believe." This made sense to me, and it seems to make sense to my students. In helping these young men to formulate their own industrial arts beliefs, you should encourage them to read periodicals, newspapers, and reference materials, to review industrial arts objectives, and to participate in class discussion. This should be an integral part of all industrial arts classes, not just lecture or theory classes. Then, if you will have them list these beliefs, you will find them well on their way to formulating their philosophy.

You should strike while the iron is hot to provide guidance and direction, and you should show enthusiasm in your presentation on how to prepare a philosophy of industrial arts education. To me, this also means promoting professionalism. You should discuss local, state, and national professional organizations as an important part of your program. It is my belief that we have a professional obligation to promote and inform our students of the opportunities which professional organizations hold for them.

If you hope to be successful in motivating your students, you must believe in yourself, and you must believe in your profession. You must command the respect of your students by your efforts and accomplishments, by fairness in student-professor relationships, and by providing suggestions and guidance. Above all else, you must remember you are preparing teachers who will teach our phase of general education, and that phase is to develop worthy, useful citizens for our community, state, and nation.

You will find that developing a sound philosophy of industrial arts education is not an overnight process. It is a continual process of building ideals and beliefs through four years of undergraduate education.

MANIPULATIVE SKILLS

Manipulative skills and pride in craftsmanship should not be a lost word in your program. I have yet to observe any teacher who has poise, confidence, and the respect of his students who walked up to a machine to demonstrate a cut with a shaky voice and quivering hand. If you have any hope of preparing a teacher for the future, I recommend that your program include a sufficient amount of fundamental skills in machine and hand tool operation. I know of no better way to promote and instill pride and confidence in your graduates. Throughout our land today, we certainly can use a lot more in the way of pride and craftsmanship. By technology we have sent men to the moon; here at home we have not been able to deliver the mail on schedule. The perfect house is yet to be built, the rattle-free car is yet to be produced, and the trouble-free appliance is yet to be manufactured. Yes, there is room in our society for the unusual person who possesses manipulative skills and has pride in craftsmanship.

RELATED INFORMATION

The potential teacher will need fortification in his technical-industrial background. He will need a basic understanding of the various materials available and knowledge of how, why, and where these materials can be found, produced, constructed, and utilized. It is unreasonable to expect the beginning teacher to be a walking library of resource material. However, it is your responsibility to see that he has a micro-unit in many areas. You should remember to teach him how to procure the vast amount of materials and resources which are available to him and, in many cases, are free for the asking. You should make him realize the importance of related information to his program.

METHODOLOGY

You have all heard, "Teachers teach the way they were taught." Assuming that there is a great deal of truth in this statement, I say we are in deep trouble unless we begin to police ourselves. How shocking it might be to our students if some of us were to come to class well prepared with a new syllabus, list the class objectives, explain course performance requirements, and utilize audio-visual materials expertly. Then we could be proud to say, "Do as I do."

If you expect a beginning teacher to be an asset rather than a hazard on his first assignment, you must provide him with the opportunity to develop teaching skills and responsibilities. During his lecture and laboratory classes on campus, he should be given numerous opportunities to teach. No, gentlemen, one 15-minute shot will not do the trick! If you expect to produce professionals, then you must accept the responsibility of demonstrating to the potential teacher the various traditional and innovative teaching methods and let him practice on you, not on our future citizens. The potential teacher should be provided the opportunity to do observations in many different industrial arts areas in his first and second college year. He should be provided a check list of what to look for during these observations. Some items on a check list might be: availability of a course outline; utilization of teaching aids; availability of laboratory materials; maintenance of tools and machines; class discipline; teacher-student rapport; teaching methods; safety and physical settings, etc. He should be assigned as a teacher's aide in his second or third year, followed by his student teaching experience in his senior year. A written report, evaluation, and discussion should be an integral part of each of these experiences.

For your program, you should select fundamental concepts and skills which possess the potential of flexibility. The student will need to broaden his perspective and basic understanding of the many innovative methods and programs available to him. You, as a teacher educator, will be able to present many teaching methods and techniques. Some examples of methods and techniques which you could include in your program are: program learning, cybernetics, simulation, micro-teaching, systematized personalized instruction, and visual aids. In presenting this type of material, you will expose each student to a vast amount of material, as well as familiarizing him with the technique used and the potential of each of these methods of teaching.

SELF IMPROVEMENT

If you are experiencing difficulty in keeping up the pace of preparing teachers for the future, you might wish to evaluate yourself on the following items:

1. I get a severe pain when I get a new idea.
2. I receive very little criticism, as I am doing very little.
3. I am practicing rhetoric rather than teaching to the level of my students.
4. I demand respect rather than commanding respect.
5. I am unwilling to experience anxiety.
6. I have not established goals to work toward.
7. I am unwilling to change my mind.
8. I am teaching for yesterday, not tomorrow.
9. I do not have a sound philosophy.
10. I am in trouble from the lack of organization.

If your answers to several of the above items are yes, I can safely say you are in trouble.

If you are in trouble, you might consider the following suggestions as a means of getting out:

1. Recognize that each student is gifted in his particular way.
2. Good teachers ask how and why.
3. Greatness begins with being different.
4. Your growth depends on your willingness to express and experience anxiety.
5. Be a good salesman.
6. Be willing to stand up and stay up.
7. Recognize that Evil is when good instructors and students are doing very little.
8. Be a bit more aggressive.
9. Work harder and plan more effectively.
10. Be determined to succeed.
11. Develop a sincere respect for your field.
12. Radiate enthusiasm in what you are doing.

I believe you can make the difference by good teaching. If you have a creative behavior, you will be able to recognize, understand, and stimulate your students to do their best while they are in your presence.

SUMMARY

If you have been successful in designing a college setting, disseminating educational methods and materials, providing stimulating leadership, and commanding the respect of each student, you have set the stage for him to gain his direction and assume his role in the field. When he leaves your campus, he should understand the total educational system, should possess a philosophy of industrial arts, should be able to identify objectives of his field, to organize instructional material, to evaluate effectively, to stimulate students, to organize learning activities, and to teach like a professional.

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Profile of an Innovative Industrial Teacher Education Department

Ronald D. Bro

During the past decade, we have seen the development of many new curricula in industrial education, perhaps more than in any other decade in our history (Cochran, 1969). Yet it appears that we have just "scratched the surface" in implementing any of these programs on a nationwide scale. Educational change historically has been a very slow process—in some instances requiring more than 50 years for a practice of proven value to become implemented throughout the American school system. Under extraordinary

OUTSIDE INFLUENCERS ON CHANGE IN THE DEPARTMENT

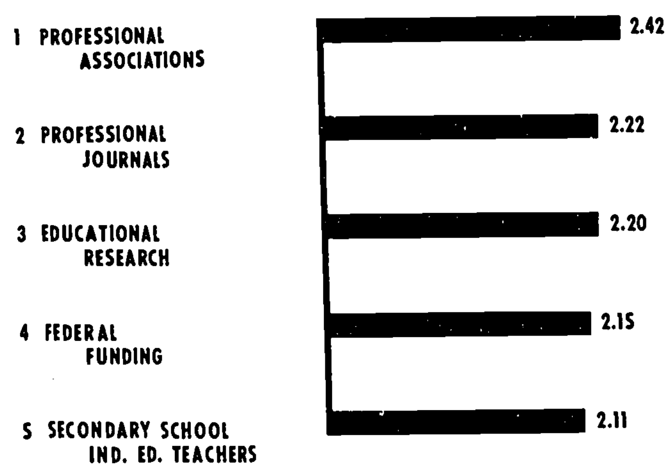

FIGURE 4

innovation is not likely to implement the innovation—even if all major barriers are removed. It might be of some value then to note how the instructional staff members in the two groups differed in their beliefs regarding certain aspects of proposed changes. Those in the more innovative departments, as it turned out, were significantly in stronger agreement that:

1. Conventional programs (typified by classification of content under such areas as "metalworking" and "woodworking") on the secondary levels are in need of change and redirection.
2. There is need for more direct integration of science, mathematics, and English with industrial education on the secondary level.
3. Content (on the secondary level) should be classified under broader concepts or occupational areas of industry—such as research and development, management, production, communications, distribution, and services.
4. There should be less emphasis placed on manipulative skills in favor of more diversified learning activities.

However, most of the respondents agreed that new teacher education programs are needed to acquaint teachers with the total organizational structure and operations of industry.

Although most disagreed with the statement that little change in "conventional" industrial teacher education programs is advisable at the present time, the staff members in the less innovative departments were decidedly stronger in this belief.

There is apparent uncertainty about when and where instruction on the innovative programs should be provided. About half thought it was better suited for graduate programs than for undergraduate programs.

In keeping with the title of this presentation, the summary will provide a form of profile of the more innovative department. It should not be interpreted as being a measuring instrument, but should provide some insight into factors which influence the rate of change in industrial teacher education. On the average, the more innovative department looked something like this:

Size of professional staff	3 - 5
Number of graduate students (masters and specialist levels)	11 - 20
Number of special allocations for curriculum research—5-year period .	1 - 2
Average yearly expenditures for purchase of equipment and/or media .	$10,000 - $15,000
Average yearly allowance for institutional travel	
Chairman	over $150
Staff member (professional)	$100 - $150
National conventions, seminars, or institutes attended by	
Department Chairman in past 5-year period	over 6
Number of professional subscriptions to which the Chairman subscribes.	over 5
Staff members are, in general, convinced that change is needed and have strong views on the directions for change	
Major barriers to change are insufficient time and inadequate equipment for implementing desired changes	

This presentation has included some of the factors of curricular change in industrial teacher education departments which relate to implementing curricular innovations on the secondary level. Variations in development and diffusion rates in these departments have been accompanied by differences in human resources, financial resources, and philosophical differences regarding the desired functions of industrial education programs on the secondary level.

Recognizing that development, implementation, and diffusion of innovations is a highly complex process, it seems apparent that more research along this line is needed in industrial education. Miles was quite explicit in this regard when he said:

> We need to know . . . what the causes of resistance to change are in educational systems and why particular strategies of change chosen by innovators succeed or fail. . . . Given an increase in understanding, it seems likely that we may be able to manage educational innovation somewhat more skillfully than we have in the past (Miles, 1964: p. 40).

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The Professional Sequence: Our Pride and Our Problem

George R. Horton

I will address all of you today as teacher educators for, regardless of your position, title, or level, I view teacher education as a process that involves the total profession. It is not an exclusive function of the campus clan.

Given a group of intelligent men and women with an expressed intent to teach, and, let's say, with entry-level technical skills and knowledge, what proficiencies, understandings, and attitudes can we provide that will earn them the professional title of teacher? In a day when people are struggling with such concepts as accountability, performance criteria, evaluation, and the critical nature of supply and demand, which is changing even in our specialized field, we had better be able to demonstrate the difference that professional instruction makes. Not only must we as teacher educators demonstrate our impact, but it must be recognized and accepted by the public.

The professional sequence should be designed to guarantee these differences in skills and behavior as a teacher. I think I should change my habit of calling this the professional sequence and call it the professional element or component. Sequence has the connotation of a fixed order, and I am becoming less convinced of any magical qualities of a set sequence for all students. In fact, I am disenchanted with prerequisites, not as a reality in some cases, but in the superficial way they can find their way into course descriptions and the arbitrary manner in which we apply sequences and prerequisites for administrative convenience.

What makes up the professional component? Let's build a simple frame of reference, because I then want to discuss the importance of new trends and indicate easy ways for you to become involved. We have a tendency to lump all of these professional courses and experiences under the term of "methods." Perhaps the following analysis, without going into detailed definitions, will be helpful. Three major elements are evident to me: Foundations, Competencies, and Practice.

FOUNDATIONS

Early orientation to career fields is important. Such orientation, if experienced by a varied student body, can also be an effective recruiting device since a large number (almost half) of industrial arts majors choose to major in industrial arts after they enter college. The typical requirement of an introductory course to American education, which emphasized the historical and philosophical base, is not the type of orientation I value here. Too often these courses neglect the role and contributions of the practical arts as an integral part of American education. Further, these courses are usually offered in the junior and senior year, when it is too late for optimum effectiveness in orientation or recruitment.

Foundations experiences can appropriately include introduction to the role of a teacher. They can identify elements of instruction and instructional systems, as distinguished from an introduction to education within a social system. Functions of this category of foundations could be listed as follows: career orientation, interrelation of knowledge, tasks of teaching, and school and society.

COMPETENCIES

The role and nature of the teacher's tasks are affected by accelerating change, as are other areas of human endeavor. Three broad eras of teacher function can be characterized as the historical era of "the information dispenser," the current era of "activities manager," and the future era of "diagnostician, strategist, and evaluator."

In this framework, courses in the professional phase dealing with educational psychology, sociology, instructional systems, organizational problems, evaluation techniques, clinical experiences, course and curriculum construction, facilities planning, and others are noted.

PRACTICE

Appropriate practice and application of theory is essential in the development of a professional. There are several integral subelements of practice. We think of student teaching immediately, but the list is longer. An abbreviated classification might be: observational experiences, clinical experiences, student teaching experiences, and internship experiences. Therefore, when we speak of the professional component, we must visualize foundations, competencies, and the necessary practice to make observable differences in the performance of entry-level teachers.

With this base, we can approach some problems as I perceive them.

WHO CARES?

Who cares about the program administration? If you in teacher education cannot identify personnel with sole program responsibilities for the professional component, I think you are in trouble. I firmly believe that the professional component should be clearly identified in the administrative structure at the college, school, division, department, and area levels, in both line and staff relationships. To rely only upon committees and the instructional staff of the so-called methods courses for program development and monitoring is a risky route. I am advocating commitment and involvement of industrial arts personnel in the mainstream of professional education. I agree with the theory of exemplary instruction; that technical area instructors can serve as models of teaching competency; that it will have positive impact upon the students; that they will tend to perpetuate the educational methods through which they themselves learned best. But this is not enough. If you profess to be a part of educating students for a career in education, you must be involved in the program administration of the professional component to be effective. You cannot afford to focus on the technical specialities alone.

Now that we have loosely defined the professional component and called attention to the need for its protection by administrative as well as instructional recognition, let us look ahead to trends and developments.

I predict that the predominant issue facing professional educators in the 1970's will be performance-based teacher education, with credentialing resulting from demonstrated competency. This is a relatively safe prediction, probably more accurately termed an observation. PBTE has all of the characteristics of a full-fledged movement. I can appreciate the reticence of many to hop on what may appear to be a bandwagon; but, fellow educators, we had better see what the parade is all about. The State Departments of Education are gearing up; several major universities are in various stages of pilot programs; and it is a concept readily acceptable to the public. The impact upon the professional component will be crushing if you do not have the structure to absorb it.

WHAT IS PERFORMANCE-BASED TEACHER EDUCATION?

Our traditional approach to educating teachers has been an experience-based program. The teacher-in-training experienced specified courses, sequences, units, and experienced practice teaching as a culmination. Performance was measured by some marking system with specific objectives not usually evident. Performance-based programs have detailed, measurable behavioral standards that are publicized and agreed to in advance of instruction. The student must demonstrate skill in promoting effective learning or exhibit behavior that is known to result in this.

Briefly, there is agreement now within the American Association of Colleges for Teacher Education on the essential elements of PBTE, and I have abstracted these from the recent AACTE publication, "What is the State of the Art," a committee report.

1. Demonstrated Competencies (knowledge, skills, behavior) are:
   - A. Derived explicitly from teacher roles
   - B. Stated for specific assessment of behavior
   - C. Made public in advance
2. Assessment Criteria are:
   - A. Based upon specified competencies
   - B. Explicit in standards and conditions
   - C. Made public in advance

3. Assessment
   A. Uses performance as primary evidence
   B. Considers other evidence of students' cognitive abilities
   C. Strives for objectivity
4. Students' progress determined by demonstrated competency—not time dimension or course completion
5. Instructional program is designed primarily to implement the foregoing elements

We could discuss PBTE at length, but my purpose is to stimulate your sensitivity to the current issues in designing and administering the professional phases of your programs and not to load you with information that you can best research for yourself. Indeed, many of you are already deeply involved in the operations that I am alerting others to.

WHO WINS—WHO LOSES?

Who becomes a certificated teacher? Who fails to measure up? Teacher education in general and industrial arts teacher education in particular has not faced this problem for a long time, if ever. The national average for failure in student teaching is 1 in 100. Now this tells me that we must have had an effective selection and retention feature in our professional component prior to the student-teaching phase. I don't believe it!

Accrediting procedures such as those followed by NCATE are becoming more stringent in this respect. The changing proportion of supply and demand will shake us to awareness of this problem. Something happened this winter that was a new experience to me—I learned of three industrial arts teachers within a two-week period who were fired for incompetency. School administrators are showing at least some bravery, perhaps confidence: and it is all related to the selection/retention function that must become a part of the professional component. I remind you of an earlier point that there must be some administrative accountability in program administration for this to happen.

As we move toward performance-based criteria and away from the experience and course-hurdling programs, the selectivity question will loom larger; but I predict it will be more easily answered.

MODEST BEGINNINGS

We could pursue this task further and speculate on the impact of other hot topics as they relate to professional education—topics including differentiated staff, career and development theory, accountability, values, and the like. However, I would like to share with you some of the approaches that Bowling Green State University has taken in shaping the professional component in industrial teacher education. None of this is considered an earth-shaking innovation; none of this is supported by grants; none of this has yet reached performance levels that we are satisfied with. The program I will outline was developed out of the hide of department staff; it is accepted and supported by the entire department with a good deal of pride; it is understood and endorsed by the large majority of our 200 teacher education majors; it continues to evolve and warrants close monitoring for improvement.

THE BOWLING GREEN PLAN

Sequence Element	Distinguishing Features	Qtr. Hrs.
YEAR I		
Introduction to Industrial Education & Technology	Orientation to careers structure of B.G. program—content of technology Epic Graco Maco	2
Field Experience	One week teacher aide	1
YEAR II		
Elements of Instruction	Analysis of interaction role of the teacher, principles of learning, domains of behavior	3
Field Experience	One week teacher aide	1

YEAR III		
Scope and Sequence of Instruction	Instructional systems performance in industrial team—total planning experience (TPX)	3
YEAR IV		
Student Teaching	Targeted placement in center—exemplary programs—coordinated seminars—specialized supervision	15
Organization and Administration of Industrial Education	Curriculum development, facilities planning and management, safety administration, fiscal considerations, total organizational experience (TOX)	3

This 28-hour block represents the professional sequence directly administered by the faculty within the Department of Industrial Education and Technology. An additional block of 16 hours at the upper division is administered by the College of Education. This includes educational psychology, measurement and evaluation, and foundations of the American education system. Many students elect a quarter of combined in-school and on-campus experience called "Project Interaction" as an option for this block. In total, 23% of the baccalaureate is devoted to the professional element, a healthy proportion, but well within acceptable limits. Of this total, over 62% is administered within the Department of Industrial Education and Technology.

For the record, I have reproduced copies of two distinguishing features in the Bowling Green Plan. These are the TPX and the TOX.

BOWLING GREEN STATE UNIVERSITY
DEPARTMENT OF INDUSTRIAL EDUCATION AND TECHNOLOGY

TOTAL PLANNING EXPERIENCE (TPX)

Objective: Instructional Scope and Sequence students (IET 352) will plan, implement, and evaluate a unit of study and/or activity under actual conditions in the public schools.

Tasks: A team of from two to four IET students will perform the following tasks independently:

1. Establish instructional objectives.
2. Select appropriate instructional activities.
3. Design pre-assessment (formal or informal).
4. Administer pre-assessment instruments.
5. Organize and develop a lesson plan.
6. Instruct and supervise appropriate practice.
7. Design and administer post-test.
8. Perform interaction analysis on a 15-minute class session if appropriate.
9. Plan and differentiate the above tasks as a team responsibility.
10. Submit individual analyses and recommendations of the experience.
11. Submit a group report of the experience.

Time: Each team will be responsible for two public school periods—a total of four university class sessions during a two-week span being the maximum IET 352 class time devoted to TPX. One TPX per quarter.

Supervision: Both the campus professor and the cooperating teacher must approve the assessment instruments and the lesson plan before any classroom activity. The cooperating teacher will assume a subordinate role during instruction, as in a student-teaching situation. The teams are to be unassisted except in instances where safety and discipline may be a factor.

Topic: The selected TPX unit must be either supplementary (enrichment) or an integral part of the course of study. It must contribute to the goals of the course as established by the cooperating teacher.

Arrangements: The public school students should receive a brief (5-minute) orientation (oral and/or written) describing the experience. The only special consideration would be that the students may wear a name tag (first name) for the benefit of the student instructor. Schedules will be established by the cooperating teacher and the campus instructor, with final clearance by the principal or other appropriate school officials designated by the principal.

Evaluation: Any grading of the public school students will remain the prerogative of the cooperating teacher. Student instructors will assess and record behavior only as a feedback for evaluating the effectiveness of their team instruction and making recommendations.

maximizes his instructional time; to diagnose and help to provide possible alternatives or solutions to learning problems; and to assist the learner in assessing his achievement with a variety of tests.(4-32) In this new role, the teacher becomes an identifier of learning problems and a manager of classroom activities, not a presenter of information.

The major role of an industrial arts teacher in a multiple-activity laboratory is to be a teacher-manager of the learning environment, one who is sensitive to individual differences.

As a teacher of individuals, he is most concerned with adjusting instruction to the learner's ability through individualized instruction, small-group, or medium-sized-group teaching formats. Educational psychologists state there are many aspects to be considered in adjusting instruction to the learner's ability. Some of the aspects are: beginning instruction at a level of difficulty consistent with the learner's readiness; relating the new experience to previous experiences familiar to the learner; and adapting the pace of instruction to the rate and quality of comprehension of the individual learner.

DIFFERENT METHODS AND MEDIA SOUGHT

To meet these and other psychological criteria, new supplemental teaching methods and supporting media were sought that were practical and that could be realistically incorporated into industrial arts laboratory courses at The University of Alberta. Traditional and contemporary teaching methods and available media were analyzed to determine their appropriateness for maximizing the objectives of the program and for individual students. Media were sought that could improve the quality of instruction through the individualization of instruction and provide the instructor with an enriched variety of supplemental teaching methods and instructional material, teaching methods and media that would: accent student inquiry, arouse the student's imagination and make him want to progress on his own; involve the student as an active participant in the teaching-learning process; and give the instructor the latitude to select from a wide variety of teaching methods and media those most appropriate for the individual progress of each student—methods and media that would place more of the responsibility for learning on the learner and not on the teacher.

This learner-centered instruction approach differs considerably from the traditional teacher-centered approach to instruction, although the teacher in both instances determines the content to be learned. In learner-centered instruction, the procedures used to acquire course content are determined by the student.

In learner-centered instruction, great emphasis is placed on how the student learns, so that he can adjust to any new learning situation with a minimum amount of apprehension or frustration. Learner-centered instruction is defined as a system of teaching that is highly structured content-wise, is oriented to the needs of each individual student, is self-instructional on the part of the learner, employs a wide variety of teaching methods, and is cross-media in approach.

THE STUDENT

In order to facilitate learning, the teacher exercises limited control over the student. While not leaving the students completely to their own devices, the teacher does give them guidance toward developing the proper attitudes that will permit them to search out their own answers and to judge their own progress. This is intended to develop the student toward independence and responsibility for selecting the methods and media best suited to the learner's individual learning style.

Communication with the teacher and between class members is free and open. The students are free to express their feelings or opinions that are relevant to the teaching-learning process. It is through this type of interaction that the students come to understand their role in the individualization of instruction.

When the occasion arises, each student is expected to perform "peer teaching," to help other students, and is free to offer open helpful criticism of the student's performance. The results of student performance are openly revealed on the product chart, so that the student and his peers are informed of the results of assessment.

PHYSICAL ENVIRONMENT

The physical environment where learner-centered instruction is used must be recognized as a crucial element that affects students and teachers if the individualization of be closely correlated with the learning experiences that the student would be involved in, and that it contribute maximally and sometimes uniquely to concept building.

Manufacturer's instructions are considered as supplementary textbooks. Considerable use is made of these instructions, because they are more current than textbooks and because they are more readily available for both student and instructor use. These instructional materials are used by consumers both to learn the correct sequential procedure to be followed in operating a new piece of capital equipment and to learn the correct procedure to be followed in working with a new material.

Experience with individualized instruction indicates that this methodological approach was successful in permitting students to pace their learning according to their learning style and abilities; to use their learning time more effectively; to become active participants in the teaching-learning process; and to optimize their instructional time while in the laboratory. When individualized instruction was first introduced as a teaching methodology in 1965, undergraduate industrial arts students, when informed that they would be responsible for determining the rate and pace of their learning, were apprehensive. Once they became familiar with this method of instruction and learned to use it to its greatest advantage as active participants, their acceptance has been most favorable.

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Unions

Professional Negotiations: A Trend in Higher Education

Louis G. Ecker

It may be appropriate to indicate to this group the nature of my involvement in professional negotiations (PN) over the past four years. During the period of time, I have served on a university senate committee which was charged with the responsibility of studying alternate methods of PN. Subsequent to this report, the faculty at Central was organized in September 1969 for purposes of collective bargaining. I served on the faculty negotiation team for two successive years, which culminated in a one-year Agreement for the Academic Year 1970-71 and the present Agreement, which is a three-year contract. My bias on the issue of PN should be quite clear from my previous comments.

COLLECTIVE BARGAINING DEFINED

A bulletin published by the Industrial Relations Center at the University of Hawaii defines collective bargaining as follows:

> Very simply stated, collective bargaining is the process of joint decision-making between two groups: employees represented by a union and employers represented by management. After negotiating a mutually-acceptable agreement, putting it in writing, and signing it, then both parties administer the agreement on a day-by-day basis. Machinery is usually provided within the agreement (grievance procedure) for handling all disputes arising under the agreement, including submission of the dispute to final and binding arbitration. Once a system of collective bargaining has been entered into, it is an on-going process so long as there is a certified bargaining agent for the employees or so long as law permits a bargaining arrangement for employees and employers. What is bargained about varies greatly, but today, in the private sector, the list of items negotiated runs into the hundreds, and the same thing is developing in the public sector.

William F. McHugh in an article published in the Wisconsin Law Review states that:

> Collective bargaining is a process, adversary in nature, which is designed to resolve conflicts arising in an employment relationship. . . . Thus, collective bargaining, as the term is used here, means not only the actual collective negotiation sessions but also the complicated and subtle university-professional relationships that develop as the parties live under the contract.

The collective bargaining process need not be inherently an adversarial relationship. It simply is not a consensus and advisory approach to resolving various issues.

UNIONISM-PROFESSIONALISM

There are those who take the position that unionism is incompatible with professionalism. Those who take this position assume that collective negotiations cannot function without erosion of the values for which higher education presumably stands. I would submit that this problem is basically one of semantics. The best interest of the faculty, university, and students can be protected and enhanced through the bargaining process. For example, the American Medical Association and other similar vocational organizations, which are not referred to as unions, are in fact just that, and yet they have a highly respected professional image.

Collective bargaining can be made as "academically respectable" and "professional" as those involved want to make the process. Thus, the real issue is not collective bargaining vs. no collective bargaining, but how collective bargaining can best be used to preserve, enhance and advance the total situation in higher education (McHugh, 1971).

THE LEGAL BASIS

The legal basis for collective bargaining with public employees, although a recent phenomenon, can be traced back to the Wagner Act of 1935 which gave employees covered fessional judgments about the value of an individual faculty member's service to students, the university, and the profession.

Secondly, the administration may ask that faculty relinquish their right to participate in making professional judgments concerning any or all of the items previously listed. If successful in such an attempt, a hierarchy of deans, assistant deans, and assistants to the assistant could result which would indeed be unfortunate.

Extreme care must be exercised in the selection of those faculty members who represent the faculty in the bargaining process. Their function clearly is not to provide for their own well being, but rather to be well informed and attuned to those whom they represent. The quality of their judgments must always be subjected to a critical review and analysis of the faculty resulting in a ratification vote.

Lastly, we have experienced a leadership problem which partially results from the lack of released time for any of the Association officers. A further concern involves an element of control by a vocal minority of the faculty.

ORGANIZATIONAL PROCEDURES

The organizational process in the State of Michigan is quite simple, although complicating factors can be introduced by either the faculty or the administration. The first step involves the signing of a petition which simply states that an individual faculty member approves a given agency to represent his interest for the purpose of collective bargaining. These petitions are usually printed on a card and required the signature of at least 30% of the faculty for an election to be held. Each additional agency requesting recognition must present petitions from at least 10% of the faculty.

The petitions are then submitted to the Employment Relations Commission for verification. This Commission ascertains that a sufficient quantity of valid signatures has been submitted. These petitions are confidential.

If an adequate number of valid petitions has been submitted, a hearing is scheduled by the Commission between the administration and the agency or agencies which have successfully petitioned for recognition.

The purpose of this hearing is to define membership in the bargaining unit. This process took approximately one year at CUNY. The administration at Eastern Michigan University has made an unsuccessful attempt to contest the composition of the bargaining unit in court. It must be assumed that this action was intended to delay the election for another year. Typically, individuals who have the power to hire and fire cannot be included in the units. After the unit is clearly defined, an election date is established. The ballot contains at least two options. The faculty may vote for no union or the agency or agencies which have fulfilled the previously-mentioned criteria. In the event that more than one agency is indicated on the ballot and a majority of the faculty votes in favor of collective bargaining, a second election between the top two contenders may be required. All elections are organized and operated by the Employment Relations Commission.

A negotiating team is thus appointed, charged with the responsibility of developing a contract proposal. This proposal may or may not be shared with the entire faculty prior to the final revision and presentation to the administration. Upon receipt of the contract proposal, a date is set for the commencing of bargaining sessions. Hopefully, the results of this effort will be a contract which meets the faculty's needs.

Faculty members who desire to organize would be well advised to resolve the problem of what agency can best represent their interest through a series of open hearings and/or appointment of a joint ad hoc committee charged with recommending alternate courses of action prior to any formal action. The principle of divide and conquer can easily be used to prolong or delay indefinitely an organizational attempt.

WHAT AGENCY

The faculty at Central made a decision that the local Michigan Association of Higher Education (MAHE), affiliated with the Michigan Education Association and the National Education Association, was the only organization which had the power, experience, and financial resources necessary to represent our interest. Similar decisions have been made by 70% of the colleges and universities presently engaged in collective bargaining. Other agencies which frequently desire to represent the faculty include the AFT, AAUP, and faculty senate or other independent agencies.

CONCLUSION

In conclusion, the many myths which circulate through a campus during the organizational process have little, if any, basis in fact. For example, our president is still waiting for the mass resignations which were threatened some three years ago. Those who feared that stringent demands would be placed on their time are also still waiting for the installation of time clocks.

The decision to enter into collective bargaining should not be taken lightly. However, I am convinced that this process can, in fact, deal more judiciously with economic matters and basic conditions of work than other means of faculty representation. It constitutes a legal basis for resolving a variety of problems.

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Business of the Association

Minutes of the Delegate Assembly Business Meeting

March 30, 1972
Dallas, Texas

Edward Kabakjian

President Frederick Kagy called the meeting to order at 1:20 p.m. Dr. Kagy appointed Mr. Kenneth Brown as Parliamentarian for the business meeting.

Dr. Kagy called for the reading of the 1971 Minutes of the Annual Business Meeting. Dr. Edward Kabakjian, Executive Secretary, read the minutes. Miss Laura Lewis, New Jersey, moved for the acceptance of the minutes, and Dr. Kenneth Schank, New York, seconded the motion, which carried.

Dr. Kagy called for the reading of the Treasurer's Report. Dr. Kabakjian read the Treasurer's Report and Mr. Harold Bretz, Louisiana, moved for the acceptance of the report, which was seconded by Mr. Raymond Cornwell, Illinois. The motion carried.

Dr. Kagy presented the President's report, which revealed the many accomplishments of the association during his year at the helm. He announced that a more detailed report was forthcoming in the Spring issue of the Monitor and the Convention Proceedings.

Dr. Kagy called for old business. There was no old business.

Mr. Sherwin Powell, Immediate Past President, was asked by Dr. Kagy to present the proposed resolutions to the delegates for their consideration. Robert Sharp, Maryland, moved for the acceptance of acknowledgment resolutions A-72-1 through A-72-12, and Willis Ray, Ohio, seconded the motion, which carried.

Mr. Sherwin Powell presented the current resolutions and individually moved for their adoption. Seconds were rendered by: C-72-1, Laura Lewis, New Jersey; C-72-2, Dale Lemons, Kentucky; C-72-3, Anthony Scime, New York; C-72-4, Allan Myers, Maryland; C-72-5, Verne Crawford, Illinois; C-72-6, Frank Haynes, Indiana; C-72-7, Ted McCoy, California.

Editorial changes in several resolutions were suggested from the floor and were found acceptable by the authors. No formal action was requested for the editorial suggestions.

The President, Dr. Kagy, called for new business from the floor. Anthony Scime, New York, presented a resolution, which read, "We move that the Executive Board of the American Industrial Arts Association, with the cooperation of the member state associations, be directed to develop and fund membership promotional programs within the member states with the intent and purpose of establishing a close and effective working relationship between the state associations and the national office of the AIAA.

"Be it further moved that the American Industrial Arts Association and the state associations establish a minimum goal of 25% growth for the 1972-73 fiscal year." Durant Mosely seconded the motion. The motion was defeated.

Harold Bretz, Louisiana, moved that the Executive Board negotiate a study of the governance structure of the AIAA and that a report be given to the House of Delegates by this time next year. Jim Dixon, Tennessee, seconded the motion, which carried.

Allan Myers, Maryland, moved that the Executive Board of the American Industrial Arts Association give study to the resolution submitted before this delegate assembly on March 29, 1972, by the Legislative Committee of the AIAA proposing that additional staff assistance be given to the Executive Secretary's office. The purpose of such assistance would be for the allowance of increased time and effort directly related to legislative matters concerning the industrial arts profession. This study is to be acted on not later than January 1, 1973. If a favorable action is taken, this position is to be filled as soon as it is financially possible. Ted McCoy seconded the motion.

Dr. Kagy introduced the new officers, gave a report on the 1972 Conference in Dallas, and announced the 1973 Conference in Atlantic City.

After brief announcements were made, the meeting was adjourned at 3:30 p.m.

Resolutions of the Delegate Assembly

Delegates from 44 states met at the annual business meeting, Thursday, March 30, 1972, in an atmosphere that could be compared to that of a political convention. The following acknowledgements and resolutions were submitted and approved during the meeting:

ACKNOWLEDGEMENT RESOLUTIONS:

A-72-1. Appreciation to the President. Whereas Frederick Kagy, as president of the American Industrial Arts Association, has given so liberally of his time and his talents, exhibiting an outstanding capacity for leadership, and

WHEREAS, the Association has made exemplary progress under his leadership,

Be it herein recorded, that the Association, through its membership, officers and executive board, express its fullest appreciation to him.

A-72-2. Appreciation to the Convention Committee, the Program Committee, and the Program and Convention Participants. Inasmuch as the Thirty-fourth Annual Convention was possible through the direct dependable and efficient service of great numbers of members of the Association, and inasmuch as the convention has achieved a resultant outstanding level of success.

Be it herein recorded that sincerest appreciations are expressed to M.D. Williamson, General Chairman, and W.A. Mayfield, Program Chairman, to the members of convention committees, and to all the teachers, supervisors, teacher educators and students, whose efforts in total produced this convention.

A-72-3. Appreciation to the Texas Industrial Arts Association. Inasmuch as President Jerry McCain and the TIAA Executive Board gave up their state convention this year and worked so diligently to make this convention a success,

Be it herein recorded that the American Industrial Arts Association expresses its appreciation to TIAA and their contribution to the 1972 conference.

A-72-4. Appreciation to the Texas Industrial Arts Student Association. Because of the involvement of the TIASA in making the student association program a success at this conference,

Be it herein recorded that the American Industrial Arts Association expresses its appreciation to the Texas Industrial Arts Student Association.

A-72-5. Appreciation to the Ship. Inasmuch as the continuing support for and participation in the conduct of the annual convention of the Association, and, in view of the excellence of this year's commercial exhibits as a dominant feature of the convention,

Be it herein recorded that the American Industrial Arts Association expresses its appreciation to Educational Exhibitors for their participation in the 1972 convention.

A-72-6. Appreciation to the Teacher Recognition Program. Inasmuch as the Association is dedicated to encouraging excellence in teaching, and inasmuch as its program of recognition of outstanding teachers is marked with increasing excellence,

Be it herein recorded that expressions of appreciation are tendered William Landon, Vice-president for Classroom Teachers, and his committee for their contribution in the conduct and promotion of this program,

Be it also recorded that appreciation is expressed to the officers and members of state associations who have participated in this program.

A-72-7. Appreciation to the Vice Presidents. Whereas Donald Lux, President of the American Council on Industrial Arts Teacher Education; Robert Hostetter, President of the American Council of Elementary School Industrial Arts; and William Kabakjian, Jr., President of the American Council of Industrial Arts State Association Officers have given so liberally of their time in the leadership as President of their respective Councils for the past two years and have devoted and exhibited outstanding leadership services as Vice-Presidents of the American Industrial Arts Association, and

WHEREAS, Lambert K. Sailer, Vice President for Classroom Teachers for the American Industrial Arts Association, has exhibited steadfast devotion and effective and solid leadership to the American Industrial Arts Association,

WHEREAS, the Association has made exemplary progress under their leadership roles as Vice-presidents,

Be it herein recorded that the Association, through its membership, officers, and executive board, express its fullest appreciation to them.

A-72-8. Appreciation to the Governor of Texas. In view of his support for industrial arts in Texas, and for the 1972 Conference of the Association in Dallas,

Be it herein recorded that the Association herein expresses its appreciation to Governor Preston Smith for his assistance in making this conference a success.

A-72-9. Appreciation to the Commissioner of Education. Because the progress of industrial arts education within each state reflects the philosophy and efforts of the Chief School Officer, the Association expresses its appreciation to the Texas Commissioner of Education, J.W. Edgar, for his demonstrated support of industrial arts education and this conference.

This appreciation is further extended to Harlan Ford, Assistant Commissioner of Teacher Education and Instructional Services; and to Dorothy Davidson, Director of the Division Program and Development, and to Neil Ballard, Consultant of Industrial Arts, for their cooperation toward this conference and for their achievements for the improvement of industrial arts education in this state.

A-72-10. Appreciation to the Public Schools. Inasmuch as the success of the 1972 convention was insured by the fullest cooperation of Nolan Estes, Superintendent of Dallas Schools, and his staff,

Be it herein recorded that the officers and members of the Association express their gratitude for their assistance.

A-72-11. Appreciation to the National Office. Because of the vital role of the national office in the effectiveness of the service of the Association and in view of the excellence of his management and leadership in his third year as its Executive Secretary-Treasurer, the full appreciation and confidence of the membership and the Executive Board is herein expressed to Edward Kabakjian and all of the National Office staff under his direction.

A-72-12. Appreciation to Man/Society/Technology Forum Participants. Whereas the Man/Society/Technology forum series has significantly involved industrial arts educators with the leadership of industry, education, government and labor from forty-eight of the fifty states, and

WHEREAS, the participants of the eight regional forums made a commitment toward the improvement of industrial arts education by financially supporting themselves to each regional forum and paid their own expenses while participating, and

WHEREAS, the Association, not having funding to pay travel nor stipends, did solicit and acquire donors to provide some meals and other assistance for the participants, therefore be it

RESOLVED, that those companies and agencies contributing financial support to the Man/Society/Technology Forum Project be extended the sincere appreciation of the American Industrial Arts Association and of the industrial arts profession,

FURTHER, that each contributor be presented a certificate of appreciation from the Association. Specifically, that these certificates be presented to:

Brodhead-Garrett Company
Scott Engineering Sciences
Philco-Ford Corporation
Charles A. Bennett Company

as well as:

Associated General Contractors
Automobile Manufacturing Association
Cope Plastics, Incorporated
DeVry Industries, Incorporated
Electronic Aids, Incorporated
Enterprise Machine Tools, Incorporated
Fairchild Industries
Frank Paxton Lumber Company

Graves-Humphreys, Incorporated
Tandy Leather Company

BE IT FURTHER RESOLVED that all participants be congratulated and thanked for their active participation in the Man/Society/Technology forums.

CURRENT RESOLUTIONS

C-72-1 Equal Rights for Women in Industrial Arts. Whereas, the Industrial Arts Program in the United States is concerned with common learning needed by all persons to function effectively in our industrial-technological society, the development of attitudes, interests, abilities, and skills, as well as the acquisition of information about occupations and professions, and

WHEREAS, certain local school boards and local administration units have prevented women from participation in industrial arts classes; therefore be it

RESOLVED, that the AIAA endorse and support the rights of women to participate equally in our American democratic system and to work toward removing such formal and informal restrictions on the opportunity of women from participating in the industrial arts activities.

C-72-2. Expansion of the Industrial Arts Curriculum. Whereas, the American way of life, which has as one of its essential characteristics the preservation of our industrial democracy, is being threatened by anti-scientific and anti-technological forces, and

WHEREAS, the forces are changing the climates of opinion of the mores of the youth culture, and

WHEREAS, the American youth are becoming increasingly concerned with the effects of technology on the ecology, and

WHEREAS, the role of industry and technology in solving the ecological problems is not being presented in the secondary school, and

WHEREAS, it is the traditional posture of education to preserve, maintain, and improve the society in which it performs, and

WHEREAS, the Industrial Arts Program in the United States is concerned with common learning needed by all persons to function effectively in our industrial-technological society, therefore, be it

RESOLVED, that the AIAA work with interested congressmen and with organized associations of educators to introduce legislation supporting a laboratory-oriented activity program in industrial arts for all students in the public schools of the nation, and be it further

RESOLVED, that this course be designed to provide those common learnings needed by all persons to function effectively in our industrial-technological society; and for the preservation of that industrial-technological society; the free enterprise system including the corporate structure and management labor relations, as well as practical laboratory activities designed to acquaint the student with the dynamics of modern industrial production, and, be it further

RESOLVED, that this course be taught by credentialed industrial arts teachers and other teachers from related disciplines who can team teach with the industrial arts teachers.

C-72-3. Career Education. Whereas, career education is currently the principle thrust of the U.S. Office of Education, and

WHEREAS, the industrial arts profession is being called upon to participate in the development of concepts and programs of career education, and

WHEREAS, industrial arts is a facet of career education, and

WHEREAS, industrial arts teachers are looking to the AIAA for direction in the development and implementation of career education, and therefore, be it

RESOLVED that the AIAA establish, adopt, and disseminate a position paper on Career Education, and be it further

RESOLVED, that the information obtained and the material developed at the 1972 conference be considered as the basis for this position paper, and be it further

RESOLVED that the position paper should be developed under the direction of the Executive Board and submitted to the delegates by mail for ratification, and be it further

RESOLVED that after ratification, the position paper be published and disseminated.

6. U.S.O.E. and State Administrative Structure for Industrial Arts
7. Career Guidance
8. Disadvantaged and Handicapped Students in Industrial Arts

The meeting was opened by Marshall Schmitt. He provided the group with a background of the forum for state supervisors. Originally, the group acted as an informal advisory group to the Specialist for Industrial Arts. In 1957, there were ten states that had State Supervisors for Industrial Arts. This group provided a "sounding-board" for the discussion of problems and issues in industrial arts. Over the years, this group has grown to include almost every state. This year, two supervisors from Canada were present, representing two different Canadian provinces.

The problem regarding the Federal guidelines for modifying the Vocational Acts to include industrial arts education was discussed. The group was informed that no specific action has been taken since the publication of the results by the ad hoc committee in the School Shop magazine. Action will probably not occur until Congress passes the enabling act. However, 219 responses have been received as a result of the article. All but a few of these responses were in favor of the guidelines as reported in the magazine.

Because the enabling act has not been passed, it was suggested by several members present to contact their Congressmen, expressing their views on the amendment of the Vocational Education Act to include industrial arts education as reported in Senate Bill 659.

Marshall Schmitt reported on some of the pending administrative structure changes in the Office of Education. Changes include the new National Center for the Improvement of Educational Systems (NCIES). This is the USOE organization that is expected to implement the Educational Renewal Site concept. Paul Manchak provided the groups with the reorganization plan for career education within NCIES.

Much discussion was held on the manner in which industrial arts programs presently use Federal funds. Fourteen states responded that these funds affected their programs in a variety of ways; program and name changes were made. The following represent some of the uses made of these funds: equipment, remodeling, supplies, mobile laboratories, textbooks, career education projects, teacher retraining, special education, advisory councils, state industrial arts office expense, teacher travel to workshops, and leadership development: career education, disadvantaged, handicapped, NDEA, exemplary vocational funds, and Part B funds.

It was pointed out that industrial arts has been receiving NDEA Title III funds. The subject areas that receive most of NDEA, Title III funds are reading, science, and industrial arts. EPDA funds have also been used for IA.

Paul Manchak of the Career Development Branch, National Center for the Improvement of Educational Systems, suggested that the state supervisors may wish to become aware of potential USOE personnel development training resources related to the goals of career education. Further developments will be reported to this group. He further suggested that the group become familiar with the University Deans' Conference to be held at Ohio Center on April 25-26 regarding career education and to let their deans know of their interest in this area. Also, 16 regional conferences dealing with career education are currently in progress. The conferences are on an invitational basis, but state superintendents would probably have attendance information. Industrial arts supervisors should contact their state superintendents, informing them of their interest in the regional conferences. It was also learned that transportable teacher training packages are being developed for career education. These should be available after July 1972. Initially, they will deal with career education on the elementary level.

Jerry Antonellis, State Supervisor from Massachusetts, made a plea that this group become a more political action group, such as the State Directors for Vocational Education. It was recognized that the state supervisors represent a force that could provide an effective voice for solving industrial arts problems.

A 15-minute film was presented on the topic, "Learning for Living in a Technological World," by Al Meyers, State Supervisor for Industrial Arts. This film will be available soon from the AIAA office. A unique feature of this film is that it is designed for different purposes, such as: (1) to explain what industrial arts is, (2) to promote the industrial arts teaching profession, and (3) to promote the Industrial Arts Association.

Bob Woodward discussed the standardized tests in industrial arts developed by the Educational Testing Service. The group was encouraged to use these tests for several reasons. First, the need for accountability in education is important, and these tests represent one aspect of the problem of accountability. Also, baseline information is needed for the industrial arts program to measure change. Further, these tests represent only one phase of a major testing series that should be developed for all grades and updated periodically.

The group decided to continue the State Supervisors Forum as an informal meeting to take place prior to the National Convention. These meetings will not appear in the AIAA program; however, it was suggested that they be more structured than the Dallas meeting. Earl Zimmerman was elected chairman to develop a program for the informal State Supervisors Forum for the Atlantic City meeting. He was also asked, along with Jerry Antonellis, to develop a letterhead for the State Supervisors' group. It was the group's feeling that the forums should be kept informal, yet provide for continuing discussion on state industrial arts problems and issues.

Several "share" items were provided to the members present, such as, (1) Alabama Industrial Arts Guidelines and Directory; (2) Middle School Curriculum Study (Bucks County Public Schools, Pennsylvania); (3) Occupational Brief, Teacher, Industrial Arts.

Teacher Recognition Program

A Teacher First

Jerry Drennan

Any article, book, or editorial that you could read on the subject will stress the fact that the profession of teaching is an honorable one. That it is a profession that is respectable, underpaid, and short of adequate personnel is also acknowledged. It is definitely an important, valuable work of mankind. Yet there are many people in the teaching profession who do not seem to realize this important or notable fact.

In the field of industrial arts teaching, we have a situation that is probably comparable to that of many other areas of teaching. We have a variety of people, attitudes, ideas, and over-all objectives. This is good, up to a point. But when a person, through his work and his attitude, begins to harm our profession of industrial arts teaching, then something should be done to correct the situation.

We have many industrial arts teachers who do not have the respect of other teachers, administrators, or laymen. These teachers are definitely hurting us. They cast a shadow upon the field of industrial arts and upon the fine profession of teaching in general. Some of these men are considered nothing but glorified janitors within their respective schools. This may be because of ignorance of their administrators to some extent, but it is the duty and responsibility of the individual teacher to educate these people to the true value and place of industrial arts in the place of education.

There are other teachers who are interested only in the projects their students are making. These teachers stress skills to such an extent that they themselves will do a major portion of the work on the student's project. Granted, the student may have a valuable project when completed and probably has developed some skills, either directly or indirectly; but it must be remembered that the project method of teaching industrial arts is only a by-product of the true value of learning. These teachers must realize that there are numerous avenues through which a student may profit. These teachers must re-evaluate (or possibly re-learn or remember) the general and specific objectives of both education and industrial arts.

Some teachers of industrial arts are in this professional area only for some secondary reason. These reasons may vary. They may be teaching only until they can secure a better job in industry, or they may be teaching industrial arts because of the extra pay involved or in order to have access to the laboratory machines. These teachers are certainly a hindrance to our profession. This type of person usually will not make professional meetings, does not belong to professional associations, and is not making a conscious effort to improve as a teacher in his field. This in turn gives a poor impression of industrial arts to other teachers and administrators and also to his students, their parents, and other laymen.

We like to think that there are not very many teachers such as those described above, but there are enough so that our profession is hurt to some extent. There are possibly even other ways in which industrial arts teachers may be hindering the work of their profession. We must all improve as a group. Our profession must improve in all ways; numerically, professional growth, and over-all activity. But this can be done in only one way—individually. One statement will express how we, as individuals, may be a greater asset to our profession. BE A TEACHER FIRST. If we are dedicated to our profession of teaching, then we will profit ourselves, our schools, our fellow teachers and administrators, our students, and our country to the greatest extent possible.

THE IDEAL TEACHER OF INDUSTRIAL ARTS

Every teacher of industrial arts should try to be an ideal teacher. By this I mean a person who is a teacher in every sense of the word. There are three things which can be recognized in an ideal teacher. The first of these is that the teacher will be a professional person. This does not necessarily mean only that the teacher belongs to and participates in the various professional associations, although this is definitely a part of it, but it takes into consideration other aspects of professionalism; his participation in school committees, faculty meetings, duty assignments, clerical work, and other necessary obligations of the profession of teaching. This should also include one's moral and ethical behavior in and out of the classroom, his activities in the community, and his attitude toward being a citizen of this great United States.

The second mark of the ideal teacher of industrial arts is his conviction and dedication to teaching as the greatest profession. This means that education and the art of teaching are recognized as the most important aspect of his life and also as the most important aspect of the lives of his students.

The third mark of the ideal teacher of industrial arts is his belief that industrial arts is the best field in education which will accomplish the purposes and objectives of general education. Every teacher should feel this way about his or her particular subject area, but especially is it important for the industrial arts teacher. The many complex areas and levels of industrial arts tend to more readily meet the over-all aims of education than any other subject. This should be easily recognized by the industrial arts teacher. This may sound a little prejudiced, but you can ask any industrial arts teacher for verification of this fact.

THE KEY TO BEING AN IDEAL TEACHER OF INDUSTRIAL ARTS

The key to becoming an ideal teacher can be summed up in one word: re-evaluation. How long has it been since you have stopped and considered yourself, your work, and your future in the light of industrial arts and education? There is no better time than now for such a project to be started. Compare your objectives and methods of industrial arts with those of general education. Evaluate your teaching in the light of local and community objectives. What is the philosophy of your school? Is it compatible with that of industrial arts and education? Is your individual philosophy an asset to your industrial arts teaching? Is your particular industrial arts curriculum meeting the demands and needs of your individual students? These are only a few suggestions which may help you in your evaluation. Also to be considered in your re-evaluation is your professional outlook. Are you professional in local, regional, state, and national organizations of industrial arts and education? Do you support policies of these organizations? Do you actively participate? What about your local school organizations? Do you participate in faculty meetings, committees, and other duties? Do you sponsor an industrial arts club? Is your relationship with your peers, students, and administrators all that it should and could be? How are your public relations concerning industrial arts and you as a teacher to be compared with those of other teachers? Other aspects of re-evaluation should be considered, such as the benefit of doing work with a definite cause, feeling of being useful, a soul-satisfying position in life.

I personally feel that the first mark of a professional teacher is a constant re-evaluation of philosophy, objectives, curriculum, methods, and experimentation. Always remember that if you will consider yourself to be a teacher first, then the fruits of industrial arts education will automatically follow.

Dr. Drennan is on the faculty of Abilene Christian College, Abilene, Texas.

Teacher Recognition Committee Report

Fifty-four industrial arts Teachers of the Year 1972 received engraved plaques and certificates of recognition during the Teacher Recognition Awards Program of the International Conference of Industrial Arts at Dallas, Texas, March 27, 1972.

Forty-eight were from the United States, four were from the Canadian Provinces, one represented the District of Columbia, and one was from Puerto Rico. Most of the teachers were present to receive their awards.

Much of the success of the program can be attributed to the cooperation and efforts of the state representatives and the state association officers. The committee also wishes to thank Dr. Edward Kabakjian and his staff for forwarding information which was inadvertently sent to his office.

Members of the Teacher Recognition Committee are to be commended for their efforts in performing individual tasks assigned to them. They are William B. Landon, committee chairman; Russell Amling, printed forms; J.A. Rodgers Swan, Canadian program; William J. Wilkinson, plaques; Sivert Joramo, press releases; T.L. Bay, Jr., programs; Dan Lopez, certificates; Tom J. Barber, ribbons.

The chairman extends thanks to members of his family and to the secretarial staff of the Englewood, Colorado, Public Schools for the efficient manner in which they performed tasks of typing, mailing, and duplicating materials.

Recipients of the Teacher of the Year award were: Alabama, Bobbie Andrusky; Alaska, Willis A. Madison; Arizona, Roger M. Benton; California, Peter C. Sorensen; Colorado, Roger N. Benyshek; Connecticut, Garland W. Reedy; Delaware, William B. Raker; District of Columbia, Edward Grant, Jr.; Florida, Edward W. Kenyon; Georgia, Dennis M. Buchanan; Hawaii, Herbert M.C. Hee; Idaho, Erle T. Robertson; Illinois, H.E. Murdach; Indiana, Andrew J. Parker, Jr.; Iowa, William T. Strillich; Kansas, William J. Mitchell; Kentucky, Arthur L. Robb; Louisiana, Harold H. Bretz, Jr.; Maryland, George M. Haney; Massachusetts, George O. Krikorian; Michigan, Robert J. Cook; Minnesota, James D. Nygaard; Mississippi, Anthony Joel Holley; Missouri, Oliver H. Press; Montana, Clayton D. Clanin; Nebraska, Ellwin G. Fletcher; Nevada, David W. Bowen; New Hampshire, Raymond R. Miner; New Jersey, James Dadenas; New Mexico, B. Max Forrest; New York, Philip Kantrowitz; North Carolina, William T. Parker; North Dakota, John H. Olson; Ohio, Lester H. Riggle; Oklahoma, Ralph H. Garnett; Oregon, Darrall H. Paxson; Pennsylvania, William H. Skelly; Puerto Rico, Victor Barada; Rhode Island, Salvatore Covais; South Carolina, Lee G. Edens; South Dakota, David W. Merrill; Tennessee, Dennis W. Hirsch; Texas, David A. Williams; Utah, Wendell J. Petersen; Vermont, Daniel E. Winn; Virginia, Erskin F. Jenkins; Washington, Jay G. Taylor; West Virginia, Keeling L. Fife; Wisconsin, Alvin Weitkamp; Wyoming, Gordon D. Oberg; Manitoba, Ronald Magel; New Brunswick, John Gilbert Ross; Saskatchewan, Michael J. Blackwill; Ontario, Robert A. North.

The President's Report, 1971-72

Frederick D. Kagy

I am sure that each president of this association, as he writes his report, wonders how his year in office could have possibly passed so swiftly. Each year the American Industrial Arts Association adds to its contribution to the growth and development of the industrial arts curriculum and program in the schools. This year has continued this pattern. Our association has been active with legislation, relationships with other professional groups, the Man/Society/Technology Forum series, and in service to its members.

With the slowdown of the economy, your executive board has held the line on expenses to keep our budget in balance and at the same time continue to provide the services expected of the association. This has required extra work of our executive secretary and his staff. Our association can be proud of the dedicated group that form our team in the national office. It takes a group like this to keep our organization running smoothly.

Each year brings changes in societal values and educational goals. The current year has not been an exception. Commissioner Marland's "Career Education" concept has gathered considerable momentum. Changes on school financing are being discussed and changed by legislation in some states. The "college syndrome" is waning, as many degree holders are finding it difficult to obtain employment. Each of these will cause changes in the industrial arts programs. I believe the AIAA, its executive board, its councils, and its members will adjust and modify with the times and keep our association a viable force to provide the leadership industrial arts needs.

THE EXECUTIVE BOARD

The executive board for this year includes Sherwin Powell, Paul DeVore, Lambert Sailer, William Landon, Don Lux, Earl Zimmerman, Robert Hostetter, William Kabakjian, Jack Young, Edward Kabakjian (Secretary/Treasurer), and your president. The board held two meetings this year; a summer meeting at Past President William Wilkinson's summer home at Mt. Gretna, Pennsylvania (Bill supplied lodging at no cost to your association), and a winter meeting at the national office in Washington. This group worked long hours to make sure the policies of the delegate assembly were carried out and the association continued to run smoothly within its budget limitation.

RELATIONSHIP TO OTHER ORGANIZATIONS

Growth of any association is dependent upon not only its own membership and the work they do but also on its stature and relationship with other organizations and groups both inside and outside of the education field.

At our Miami Conference, the National Association of Manufacturers suggested a cooperative venture. Several meetings have been held with this group concerning long-range and short-range plans for joint projects and mutual support. Our two groups will continue dialogue and develop a sound educational program of which both organizations will be proud.

The Alliance of Associations for the Advancement of Education (AAAE) has been formed to represent 24 national educational organizations with a total membership of more than 400,000. The American Industrial Arts Association is a charter member of this group. The alliance has as its primary goal the improvement of instruction.

Probably the most significant meeting held this year was the Ad Hoc Committee formed by the U.S. Office of Education to develop guidelines for funding of industrial arts programs and a role for industrial arts in career education. This meeting has received national publicity.

On October 26 and 27, twelve industrial arts specialists were brought together in Washington to develop the guidelines for industrial arts funding under the existing Vocational Acts and for future funding for career education.

Your president was asked by Associate Commissioner Dr. Robert Worthington to name six AIAA members to represent the association. Dr. Lockette, Vice-President for Industrial Arts Division of the AVA, was requested to do likewise. The guidelines were written and published. A follow-up proposal for developing curriculum guidelines is already underway by this same joint effort of both associations. Career education has been discussed by the Commissioner of Education and his staff. President Nixon and Vice-President Agnew have published their opinions on this concept. The AIAA has held special meetings on this topic and will be taking a position on industrial arts' role at the Dallas Conference.

Commissioner Marland has asked industrial arts for support of his career education concept. If funding for career education becomes available, industrial arts programs will benefit from the industrial arts' offerings. The concept of career education and the concept of industrial arts education are closely allied and make it possible for industrial arts to make a maximum contribution with a minimum of change.

NATIONAL OFFICE STAFF

The turnover of secretarial staff has been held to a minimum, which makes for a smooth-running organization. Dr. Kabakjian has been fortunate in keeping a good staff, and his replacements have added to the efficiency of his operation. The association has been most fortunate in securing Mrs. Colleen Stamm as its managing editor of publications. The national office staff's sole purpose is to serve the membership. Your suggestions are always welcome.

THE ASSOCIATION'S PUBLICATIONS

The major publications of the association include: The M/S/T Journal, The Monitor, The Scene, and the Convention Proceedings.

This year an M/S/T Journal advisory board was initiated. This committee's purpose is to place more responsibility for our journal into the hands of the membership. The committee is made up of classroom teachers, teachers educators, and supervisors. In setting up this committee, the board hopes that this group will provide the kind of journal that the membership desires. The committee advises on themes and critically reads contributions for inclusion in the journal. Mrs. Colleen Stamm serves as the managing editor.

The Monitor and Scene are our newspaper-type publications that bring the membership up-to-date on current issues, committee work, legislative and personal information. The Monitor is the membership voice. The Scene serves the AIASA program.

The Convention Proceedings has made a tremendous contribution to the profession. Full text of all presentations at the Annual Conference are printed. Because of a change in editors at the national office, this year's publication was delayed in mailing. Photographs were included for the first time this year in the proceedings book. The book has become a sought-after text and reference book for college classes.

A new logotype of the AIAA was developed and will be used on all of its publications and other printed pieces. This is to give the association a corporate image symbol.

MAN/SOCIETY/TECHNOLOGY FORUM PROJECT

This year brought to conclusion the AIAA's Forum Project. The Forum series has been under the direction of C. Dale Lemons. Four of the Forums were held since the Miami Convention. These were held in Cleveland, Ohio; Menomonie, Wisconsin; Lebanon, Connecticut; and Greenbelt, Maryland. This series has been successful in bringing together the various segments of society interested in seeing the youth of America educated with an understanding of technology. Businessmen, industrialists, labor leaders, educators, and government officials participated with leaders in industrial arts education in bringing about better understanding of the role of industrial arts as a subject in the schools. Individual states have conducted Forum meetings to further stimulate this mutual understanding and the opportunity for assistance in developing a sound education program. A final meeting of this project brought together the regional chairmen in Washington to write the report and make plans for more intensified follow-up at the state level.

Another project of the association that developed because of the Forum series is a curriculum project called "Man and His Environment." This is being conducted at Millersville, Pennsylvania, and Trenton, New Jersey, with test areas in public schools between the two communities. This is in its initial stage. More information will be forthcoming in Monitor articles.

MEMBERSHIP

The members voted to put a limit on the percentage of life members to regular members at 20%. This was to prevent a financial strain on the association. Years ago, life membership was promoted by the association to gain funds to get the young organization on its feet. The members responded by many taking the life membership. The funds were used and not put into a life account. In recent years, the association has been trying to get the life fund built up to its proper amount so that the interest from the money will support the services the association provides. Most organizations have had this same problem; no one suspected the changing economic picture. The board appreciates the loyalty and support of its life members and the help they provided in getting the association on its feet. We hope the membership will grow so many others will be able to become new life members.

Membership in all professional organizations has decreased this year, and ours is no exception. It means that each member must take it upon himself to be an active recruiter of the membership committee. The national office has developed several pieces to attract new members. A great deal of time and effort has been spent on this. Each member must assist in attracting new members.

In order to bring the life membership account more nearly to its correct dollar amount, the Loyalty Fund was initiated. Members were given the opportunity to contribute to this fund. The dollars sent in will be banked. Only the interest on this money will be used by the association. The money contributed can be a tax deduction. This is a strictly voluntary contribution in support of your association. The board wishes to add its thanks to those who were able to make a contribution.

ON DECEASED MEMBERS

Each year our association adds to its Special Honor Roll a number of its members who pass away during that year. This year added to that list is Dr. William E. Warner, the founder and first president of AIAA. The Monitor tries to recognize these persons as the national office is informed. We take time at this point to bow our heads for a moment of silent prayer for all of these men who have dedicated their lives to the teaching of our youth.

COMMITTEE ACTIVITIES

Each of the committees of the association have sent to the board detailed reports of their activities and completed projects. The issues of the Monitor have carried these reports to the membership. It is through the activities of the committees that the real work of the association is accomplished.

The region concept for committee membership is now in its second year. We know there is room for much improvement, but through this system, more of our membership from all over the country are becoming involved in association work. The system of having the various committees report to the board through specific board members also seems cumbersome, but it too is getting the board involved more directly with the work of the association. The three-year committee assignment period also allows over the years more members doing work for the organization.

STANDING COMMITTEES

1. Accreditation and Evaluation

This committee has developed an institutional and self-evaluation form. They are in the process of testing the form for improvement.

2. College Clubs

College club advisors have been identified so that communication to the club members at the various institutions has been improved. For a number of reasons, the college clubs program was not as active this year as it has been. We believe this to be a temporary situation, and we look forward to an increase in activity of this group in future years.

3. Convention

This committee seems to be functioning smoothly. Between the national committee and the local committee, the Dallas Conference is ready for the members. Because of the extreme interest in career education by the profession, the local committee and the legislative committee added a day and a half of special meetings after the program was prepared. This required a great deal of work which I am sure we all appreciate, and all will benefit as a result of this effort.

Future conference planning committees are already at work to assure the members meaningful meetings. Future dates are:

1973 - Atlantic City, New Jersey - March 26-30.
1974 - Seattle, Washington - April 2-7.
1975 - Columbus, Ohio - March 23-28.

4. Curriculum

This committee has been most active. They have completed their report on the metric system and through resolution at Miami encouraged the profession to include instruction on this and the problems of conversion.

The current project involved the solicitation of candid comments relating to "Industrial Arts in 1980." The responses received were reported in the Monitor. The consensus of the responses seemed to indicate that industrial arts needs to more clearly define its program goals. They felt the lack of commitment may have serious effect on the funding of our programs on aspects other than occupational.

5. International Relations

This has been an extremely active committee. This group sponsored an international reception at the Miami Convention and planned one for the Dallas Conference. Several of their projects are completed and will be reported in the Monitor. The group has arranged for an "Oriental Hiliday" and Study Tour.

One of their most significant tasks is the restructuring of AIAA International Relations. Their proposal would eliminate the present Vice-President of Canada and International. This would take place at the end of the present term of F. Jack Young (1973).

A committee should be established to develop guidelines for strengthening the various countries.

There has been an establishment of a Council of International Industrial Arts Associations. The AIAA is to be a member of this council.

6. Legislation

I believe the members are aware of the progress that has been made by this committee. This group's activities have been detailed in the issues of the Monitor. This group, plus the Washington team, will continue to press for legislation that will be advantageous to industrial arts education.

7. Public and Professional Relations

The major project of this committee for this year has been the development of a prototype of a traveling display to promote industrial arts. The scale model of this display will be ready to present to the board for approval during the Dallas Conference.

8. Publications

This committee has continued with its review of new material for possible publications. The group has also been looking over present publications that are coming up for reprinting to make sure the material is relevant and should be reprinted.

9. Recruitment

The main thrust of this committee this year has been the recruitment pamphlet. The committee will plan its new thrust during the Dallas Conference.

10. Research

The main thrust is the trying out of the regional research structure the committee established under Paul DeVore. Personnel have changed and some communications have broken down, but it is moving along so there is reason to believe we will have a means of getting research to the classroom teacher and identifying research needs and happenings in the field.

Another aspect is membership (AIAA)—trying to identify why individuals have allowed their membership to lapse (a suitable instrument is being developed for this purpose) and the larger picture; the teacher and his affiliation or lack of affiliation with his profession. The preliminary study on the latter part suggests a greater need for involvement and visibility. One item that I feel will come out of the research committee's work is the question of having a council (besides the new vice-president) for the industrial arts classroom teacher.

Other work of the committee includes the feasibility of the topic "Activities" as one of "What Research Says to the Classroom Teacher" series, further identification of research problems relative to the profession, acquisition of industrial arts material, and possibility of retrieval of data paper being published by AIAA as a monograph.

11. Safety

The continuation of projects in progress (e.g., Eye Safety) have taken the major time of this committee. Subcommittees of this group are looking into the Occupational Safety Act and plan to make recommendations as to the implications for industrial arts education.

12. Teacher Recognition

The committee is again making every attempt to get 100% participation in this activity. This activity takes the full time of this group. A total of 54 outstanding teachers will be recognized at this year's conference.

13. History and Archives

The central objective of this committee is to collect, catalog, house, and disseminate a history and archives collection for the AIAA. Five areas of responsibilities have been determined. These are: (1) to prepare a written history of the association, (2) to prepare a slide series and biographical data on past presidents, (3) to make a complete collection of all publications, (4) to gather all back issues of convention printed programs, and (5) to collect artifacts (awards, gavels, photographs, plaques) of the association. Progress is being made on the five areas, with some concentrated attention on establishing a location for the collection.

14. AIASA (High School Clubs)

The American Industrial Arts Student Association (AIASA) during the past year completed the rewrite and adoption of a new AIASA constitution, developed their history, projected a five-year budget plan, and added new contests for a national meeting. Projected AIASA activities include development and organization of four regional associations which will hold individual leadership conferences and the issuing of a new AIASA handbook. Also in progress is the incorporation of a foundation for all industrial arts students. This foundation will accept donations for the purpose of providing scholarships and leadership training for our students of secondary and college levels.

15. Nominations and Elections

While these are two separate committees, their activities are closely related.

The 1972 nominations and elections procedures have been completed, and your association has selected Dr. Joseph Littrell as president-elect for 1972. Mr. Billy Mayes has been selected as vice-president for classroom teachers. The committee had an excellent slate of nominees, any one of which would make an outstanding officer.

The Nomination Committee for 1973 is progressing on schedule in acquiring names of individuals recommended from different regions and with different levels of responsibility in industrial arts education. It is anticipated that at the end of our meeting in Dallas we will be able to submit a list of nominees for verification of membership and eligibility. Plans are made to rank these and identify the top four individuals as nominees for submission to the membership. No problems have been encountered in following the directions as modified last year and approved by the Executive Committee for the Nominations Committee.

SPECIAL COMMITTEES

1. Mission and Goals

It has been suggested from time to time that the association and its officers are not as sensitive to the needs of the "grass roots" as they should be. In order to give advice to the president and the board, this committee was established. The committee membership is region-oriented, and the membership mixed between classroom teachers, supervisors, and teacher educators. The charge given this group was to develop a set of short-range and long-range goals which would be submitted to the board for their consideration in setting the direction of the association. This group has circulated a questionnaire-type instrument among the committee to establish a starting point for discussion. This group will meet at the conference and then make a report to the board. This is another step in getting more input from the members so the AIAA can more nearly meet the needs of its membership.

2. Insurance

It was a blow to the board and to the members when the insurance company dropped the teacher liability policy. This has been a popular type of insurance with the members, and it was an insurance policy that all teachers should carry. When this policy was cancelled, an ad hoc committee was established to check with other insurance agencies for the feasibility of liability insurance for the members. This committee will make a report to the board with suggestions for restoring liability insurance as one of the services the association can provide for the members.

3. Environmental Education

This special committee was established to analyze the Environmental Education Act (PL 91-516) and evaluate alternatives open to the AIAA through this act as well as the entire concept of environmental education and its relationship to industrial arts education.

The committee believes it will be difficult for industrial arts programs to be funded under this act. The committee did give strong support to the idea that the AIAA should attempt to incorporate environmental education into its philosophy.

The committee has made eight specific recommendations to the board on this subject.

4. Credentials

In the attempt to give the delegate assembly a greater voice in the affairs of the association, a credentials committee was formed. Its function is to expedite the seating of the delegates from the states. The committee will develop a seating arrangement by regions and states within regions for the delegates. The delegates' packets will be given to the persons as the credentials are checked. This should provide a more smoothly-run, speedy procedure, giving the additional time to the important items of business at the delegate assembly.

THE COMMERCIAL EXHIBITORS AND JOURNAL ADVERTISERS

So often we tend to forget about our partners in the educational enterprise. I am referring to the myriad of companies that help financially support our association by advertising in our Journal and by renting space at our Annual Conference. These men and women also provide a service to the educators in keeping them abreast of the changes being made in books and equipment. This group provides a scholarship each year to a worthy student and recognizes an outstanding educator from our field. This group provides funds for entertainment at our banquets and provides prizes at our "Ship's" program. The association appreciates the work they are doing in support of industrial arts education.

THE COUNCILS

The various councils of AIAA have, as usual, been active in their respective programs. These include:

American Council of Industrial Arts Supervisors
American Council of Industrial Arts Teacher Education
American Council on Elementary School Industrial Arts
American Council of State Association Officers

Each of the councils have submitted separate reports to the national office. These reports appear in the Monitor and in the various councils' newsletters.

CONCLUSION

The officers of the association will continue to look for methods and procedures that will allow for greater membership activity. The strength of any organization is in the interest, enthusiasm, and quality of its members. The officers will also continue to seek ways to assist the growth and improvement of industrial arts education throughout the nation. We hope that you, the members, will continue to provide your enthusiastic support of the association in its attempt at the furtherance of these goals.

Any attempt to list all of the year's activities into a single report by your president is impossible. I have only highlighted the year's activities.

I do want to thank the members for allowing me the opportunity to serve the AIAA as president. I have appreciated the work that the committee chairmen and committee members have done in making this year another good one for the association and for industrial arts education. I have appreciated the opportunity to work with the dedicated men who serve as officers and members of the board. The association's success depends most heavily on its executive secretary and his very able staff. Ed Kabakjian is a most dedicated member of this association, as well as its executive secretary; his able leadership will give continuity to our programs. The Dallas Conference will close our 1971-1972 year. I will look forward to industrial arts' continued growth under our new officers in the year ahead.

Chronological Index

Special Workshop on Career Education

1.20 AIAA
AIAA Tours
Chairman, B. J. Stamps; Co-Chairman, Ronald Foy
1.30 AIAA
AIAA Committee Meetings
1.30.01 AIAA
Accreditation Committee
Chairman, Howard Decker; Host, Rudy Koesler
1.25 AIAA
National Goals Committee
Chairman, Ralph Steeb; Host, Neil Ballard
1.30.02 AIAA
Nominations Committee
Chairman, John Geil; Host, Travis E. Bell
1.30.03 AIAA
Resolutions Committee
Chairman, Sherwin Powell; Host, Adam Busby
1.30.04 AIAA
History and Archives Committee
Chairman, Ervin Dennis; Host, Joseph A. Crum
1.30.05 AIAA
International Relations Committee
Chairman, Thomas Brennan; Host, Paul Lord
1.30.06 AIAA
Recruitment Committee
Chairman, Everett R. Glazener; Host, Rudy Sadecky
1.30.07 AIAA
Public and Professional Relations Committee
Chairman, E. L. Barnhart; Host, Donald Bays
1.30.09 AIAA
Convention Committee
Chairman, Irvin Shutsy; Host, Harrold Burton
1.30.10 AIAA
Legislative Committee—Guidelines for Funding Industrial Arts through Vocational Education Act of 1963
Chairman, Karl Gettle; Presenter, Edward Kabakjian; Resource Leader, Robert M. Worthington; Hosts, Jerry Antonellis, George James, Jeffery Roberts
Roundtable A
Discussion Leader, Robert Woodward; Resource Persons, Gardner Boyd, Leonard F. Sterry, Frederick Kagy, Howard F. Nelson; Recorder, James Good
Roundtable B
Discussion Leader, Ralph Steeb; Resource Persons, Herb Siegel, William Mamel, III, Tom Hughes, Rudy Lockette, Karl Gettle; Recorder, George Litman
1.30.11 AIAA
Teacher Recognition Committee
Chairman, William B. Landon; Host, Virgil Morrow
1.30.12 AIAA
AIAA Curriculum Committee
Chairman, Jarvis Baillargeon; Host, Robert Farris
1.30.13 AIASA
AIASA Youth Development Committee
Chairman, Andrew H. Gasperecz; Host, Richard Knox
1.30.14 TCIAA
TCIAA Business Meeting
Chairman, Rudy Cantu; Recorder, Michael Kozelsky; Host, Jerry Murray
1.30.15 AIAA
Publication Committee
Chairman, Donald F. Hackett; Host, John Mitchell
1.30.16 AIAA
Safety Committee
Chairman, Donald E. Perry; Host, Quintin Eddy

2.10 AIAA
AIAA Registration
Local Chairman, Lowell Campbell; Co-Chairman, Luby Lenorman
2.20 AIAA
AIAA Executive Council Meetings
2.20.01 ACESIA
ACESIA Executive Committee
Chairman, Robert G. Hostetter; Recorder, Delmar L. Larsen; Hosts, Bishop T. Worth, Ward McCain
2.20.02 ACIATE
ACIATE Executive Committee
Chairman, Donald G. Lux; Recorder, Daniel Householder; Hosts, Richard Boyd, James Butler
2.20.03 ACIAS
ACIAS Executive Committee
Chairman, Earl R. Zimmerman; Recorder, Sterling Peterson; Hosts, Thomas E. Conley, Joel Little
2.20.04 ACIASAO
ACIASAO Executive Committee
Chairman, William Kabakjian, Jr.; Recorder, Richard White; Hosts, Dorris Harrison, Paul Thomas
2.20.05 IACC
IACC Executive Committee
Chairman, James F. Snyder; Recorder, Jonathan Allen; Hosts, P. J. Martin, Harry K. Koch, Jr.
2.25 AIAA
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Chairman, B. J. Stamps; Co-Chairman, Ronald Foy
2.25.01 TIAA
TIAA Executive Board Meeting
Chairman, Jerry McCain; Recorder, W. E. Raborn; Hosts, James A. Wylie, Jr.; Roland Carter
2.25.02 AIAA
AIAA State Representative Meeting
Chairman, Edward Kabakjian; Recorder, Kenneth L. Schank; Hosts, Philip C. Bledsoe, Charles A. Davis
2.30 AIAA
AIAA Council Meetings
2.30.01 ACESIA
ACESIA Council Meeting
Chairman, Robert G. Hostetter; Recorder, Delmar L. Larsen; Hosts, Clay E. Chester, Leonard Hermes
2.30.02 ACIATE
ACIATE Presidents Report
Chairman, David L. Jelden; Recorder, Daniel Householder; Hosts, James D. Cody, Donald G. Mugg
2.30.03 ACIAS
ACIAS Council Meeting
Chairman, Earl R. Zimmerman; Recorder, Sterling Peterson; Hosts, James M. Cook, James Lewis
2.30.04 ACIASAO
ACIASAO Council Meeting
Chairman, William Kabakjian, Jr.; Hosts, Jesse C. Cummings, Fred R. Autrey
2.30.05 IACC
IACC Committee Meeting
Chairman, Rudy Cantu; Recorder, Jonathan Allen; Hosts, Ronald W. Curtis, Richard Hoffman
2.30.06 AIASA
AIASA Youth Development Committee—Executive Committee Meeting
Chairman, Richard Clark; Recorder, AIASA Secretary
2.35 AIAA
AIAA Tours
Chairman, B. J. Stamps; Co-Chairman, Ronald Foy

2.45.06 AIASA
AIASA Standing Committee Meeting
Chairman, Richard Clark; Panelists, Legislation, Special, Curriculum & Leadership, Public Relations, Resolutions Committee; Recorder, AIASA Secretary; Hosts, Jim R. Lambert, Stewart Steinberg
2.45.07 AIAA
Man-Society-Technology
Chairman, Edward Kabakjian; Hosts, Bessie L. Lyons, Jerry Surratt
2.50 AIAA
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Chairman, George A. Bamberger
2.55 AIASA
AIASA Student Contest
Chairman, Mickey Herbert; Hosts, Bernie Maas, Alan Gage
2.60 AIAA 545, 547
AIAA Teacher Recognition Program
Chairman, William B. Landon; Presenter, Jerry Drennan; Recorder, Billy W. Mayes; Hosts, Robert McLaren, Alton Dean
2.65 E.P.T.
E.P.T. Executive Meeting
Co-Chairmen, Delmar Olson, Robert L. Woodward
2.70 AIAA
AIAA Presidents Reception
Chairman, Sherwin Powell; Hosts, AIAA Executive Board, David P. Maggard, Sam Dean
3.15 AIAA 2
AIAA General Session No. 1—"Concerns in Education"
Chairman, Frederick Kagy; Presentation of Colors, Color Guard; Invocation, M. D. Williamson; Music, Wilford B. Crawford, directed by Clemets B. Crook; Greetings and Introduction, Dr. Nolan Estes; Presenter, Dr. L. Harlan Ford; Recorder, Paul W. DeVore; Hosts, James Grossnicklaus, C. J. Kolezynski, Dwain C. Cleere, Jerry Jefferson, Kenneth Lucas
3.20 TIAA
Texas Industrial Arts Advisory Commission
Chairman, Rex Ayers; Host, Neil Ballard
3.20.01 AIAA
Exhibits Open
3.25.01 ACIAS 148
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Chairman, Leonard Sterry; Presenters, Bill Mamel, Leonard Sterry; Recorder, Nelson Cushing; Hosts, Joe Jackson, Willie Price
3.25.02 ACIATE 68, 72, 73, 76, 79
ACIATE—Man and Technology
Chairman, Donald F. Hackett; Panelists, Donald P. Lauda, John R. Lindbeck, Rex Nelson, Robert D. Ryan, Lee H. Smalley; Recorder, Ron Hoenes; Hosts, Sammy Powell, Russell Hardin
3.25.03 ACIASAO 51
ACIASAO—"Russian Technical Education"
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3.25.04 ACESIA 23, 25
ACESIA—"A Technological Exploratorium, K-6"
Chairman, William R. Hoots, Jr.; Presenters, Norma Heasley, John J. Geil; Recorder, Delmar L. Larsen; Hosts, Jack Doherty, Charles Lewis
3.25.05 AIASA 84
AIASA—Special Interest Session—"Planning an Industrial Arts Students Fair and Exhibit"
Chairman, Mike Aaron; Presenters, Ron Foy, Steve Walker; Recorder, Kenny Dean; Hosts, Janis Stevenson, Phil Schooly
3.25.06 AIASA 86
AIASA—Special Interest Session—"Space, NASA, and You"
Chairman, Stanley Webster; Presenter, Gene Horton; Recorder, Robert Boyle; Hosts, David Thuringer, Charles E. Earhart

3.25.07 AIASA 90, 92
AIASA—Special Interest Session—"So You Want to be an Industrial Education Teacher"
Chairman, Richard Clark; Presenters, Robert Sondermon, Ted S. Jones: Recorder, Steve Dilsaver; Hosts, Darrell Clements, John Murphy
3.25.08 IACC 96
IACC Special Interest Session—"American Industry: A New Direction"
Chairman, Rudy Cantu; Presenter, Harry B. Olstad; Recorder, Jonathan Allen; Hosts, Charles Woodall, Robert Pomroy
3.25.09 AIAA
AIAA Special Interest Session—"The Female Industrial Arts Teacher"
Chairman, Walter Hall; Panelists, Nona Provo, Bessie Lyons, Sylvia J. Deavers; Recorder, Elmer S. Ciancone; Hosts, Ralph E. Dyson, James Meyers
3.25.10 AIAA 470
Special Interest Session—"Technology as a Liberal Arts Concentration"
Chairman, Sam R. Porter; Presenter—"College Cooperative Work Experience," Albert R. Squibb; Recorder, James Disney; Host, Horace Johnson
3.25.11 AIAA 194
Special Interest Session—"Working Industrial Education Classrooms in the United States"
Chairman, Frank Steckel; Presenter, Russell P. Kellogg; Recorder, Iver Johnson; Hosts, Clifton Newberry, Jesse Davilla Santoscoy
3.25.12 AIAA 198
Special Interest Session—"Developing Technical Competency Standards"
Chairman, Gerard P. Antonellis; Panelists, L. Dean McClellan, Robert Hanson; Recorder, Leo F. Hogan; Hosts, Billy W. Mayes, A. L. Malone
3.25.13 AIAA 325
Special Interest Session—"Humanism and Industrial Arts"
Chairman, John M. Pollock; Presenter, Howard S. Decker; Recorder, Thomas G. King; Hosts, Harmon Porter, James F. Fales
3.25.14 AIAA 351
Special Interest Session—"The Relationship Between Industrial Arts and Junior College Technical Education"
Chairman, D. D. Nothdurft; Presenter, L. Dayle Yeager; Recorder, Donald R. Tolbert; Hosts, Earyl B. Roddy, Charles Tuckey
3.30.01 IAVE
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3.30.02 AIAA
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3.35.01 AIAA 474, 475, 478
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Chairman, Marvin Poyzer; Panelists, Willis E. Ray, Joseph J. Littrell, Louis J. Bazzetta; Recorder, James H. Smith; Hosts, Calvin Zabcik, Wayne Becker
3.35.02 AIAA 360
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Special Interest Session—"A Comparative Study of European Technology in Industry and Education"
Chairman, Thomas J. Brennan; Presenters, Eckhart A. Jacobsen, Ricardo Rodriguez; Recorder, Willis Wagner; Hosts, Marshall Schmitt, Joe Ferrell
3.35.03 AIAA 462, 463, 465
Special Interest Session—"Strengths and Weaknesses of Supervision"
Chairman, Charles A. Bunten; Panelists, Herbert Bell, Ronald Foy, Russell P. Kellogg, James E. Gardner, Homer B. Towns; Recorder, William Paup; Hosts, Owen Houston, Jerry Dramer
3.35.04 AIAA 480, 481, 485
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Chairman, John E. Falls; Panelists, Joe Talkington, Roger A. Vicroy, Wendell Roy; Recorder, Ralph Dirksen; Hosts, John P. Suggs, William C. Bell

3.40.06 AIAA 403, 404
Special Interest Session—"The Industrial Arts Graduate in Industry"
Chairman, Stephen Randell; Panelists, Ted Jones, B. J. Armstrong; Recorder, Garth Yeager; Hosts, Robert Blakey, Jimmy Sikes

3.40.07 AIAA 117, 357, 443
Special Interest Session—"Simulation in Industrial Arts"
Chairman, Thomas J. Brennan; Panelists, William Treadway, Robert Hildebrandt, Earnest G. Berger; Recorder, Bert Mosier; Hosts, James Dye, Michael Billert

3.40.08 AIAA 161, 162, 167, 170
Special Interest Session—"Career Education—A Role for Industrial Arts"
Chairman, James L. Boone; Panelists, Herbert Siegel, Kenneth R. Clay, Ralph Ressler; Recorder, E. L. Barnhart; Hosts, William Stairevalt, Larry Lee

3.40.09 AIAA 269, 275
Special Interest Session—"Industrial Arts and Environmental Education"
Chairman, Ervin A. Dennis; Panelists, Delmar W. Olson, E. Allen Bame; Recorder, Bernard Dutton; Hosts, Ed Paloncy, George R. Roland

3.40.10 AIAA
Special Interest Session—"Accountability in the Classroom"
Chairman, Isac P. Hampton, Jr.; Presenter, William R. Erwin; Recorder, James E. Olmstead; Hosts, Gale Anderson, Gary Meek

3.45.02 AIAA
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Chairman, AIAA Executive Board

3.45.03 AIASA
AIASA Awards Banquet
Chairman, Richard Clark; Coordinator, Mickey Hebert

3.50 AIAA 3, 9
General Session No. 2—"The Future of Industrial Arts"
Chairman, Frederick G. Kagy; Greetings, Honorable Wes Wise; Introduction, Billy Windham; Presenters, Richard Clark, Allan Riggs; Recorder, William B. Landon; Hosts, Bill Elrod, Jerry Hedrick, Vincent Kuetemeyer, TIASA Officers, TCIAA Officers

3.55.01 AIAA
Illinois Industrial Education Association Reception Honoring AIAA President

3.55.02 TIAA
TIAA General Business Meeting
Chairman, Jerry McCain; Recorder, W. E. Raborn

4.10 AIAA
Epsilon Pi Tau Breakfast
Co-Chairmen, Robert L. Woodward, Delmar Olson

4.25 AIAA 11
General Session No. 3—"Providing Leisure-Time Activities for a Changing Society"
Chairman, Frederick G. Kagy; Introduction, James L. Boone, Jr.; Presenter, The Honorable Dan H. Kuykendal; Recorder, F. Jack Young; Hosts, Robert D. Nesbitt, Harold H. Bretz, Jr., Leonard Bell, AIASA Officers

4.30.01 AIASA
AIASA—"Planning Session—Old and New Officers"
Chairman, Andrew Gasperecz; Recorder, 1972-73 AIASA Secretary

4.30.02A TIASA
TIASA State Business Meeting
Chairman, Mike Aaron; Recorder, Dave Sholmire; Host, Vincent Kuetemeyer

4.30.02B LAIAC
LAIAC State Business Meeting
Chairman, Mike St. Romain; Recorder, Carol Parson; Host, John Murphy

4.30.03 IACC 103
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Chairman, Rudy Cantu; Presenter, Ted Jones; Recorder, Jonathan Allen; Hosts, Robert Pomroy, David E. Hamm, William Storms

4.30.04 ACESIA 29
ACESIA Special Interest Session – "Elementary Industrial Arts—Classroom Demonstration"

5.55 AIAA
AIAA Banquet
Chairman, Paul W. DeVore; Dinner Music, Richard Clark; Introduction and Entertainment, Wilford B. Crawford; Entertainment, Walter Blaney; SHIP's Program, George A. Bamberger; Hosts, Early Ervin, Phynus Witherspoon, Bobby Linenschmidt, Lowell Peters

6.10 AIAA
AIAA Executive Board
Chairman, Paul W. DeVore; Recorder, Edward Kabakjian

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